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MODERN PLASTICS



JANUARY 1948

**6 WAYS TO
COMPLETE
THE STATEMENT—**

"Our products need..."

DUREZ phenolic plastics have a spread of properties that make them ideal for unlimited industrial and resale products. Some are shown in these six highly successful applications. Each of them is unrelated to the others in the combination of mechanical, electrical, and chemical values the manufacturer required. One or more of these materials may well match *your* needs today.

Our continuing plant expansion, perfected quality controls, and enlarged testing facilities are reflected in the increasing use of Durez for improved, redesigned, or all-new products. If you want to know what other manufacturers are accomplishing with Durez, let us send you *Durez Plastics News* each month without charge.

Durez Plastics & Chemicals, Inc., 121 Walck Road, North Tonawanda, N. Y.

LOW-COST PRODUCTION Excellent moldability is a cost-reducing characteristic of all Durez compounds. Here a general-purpose compound with every requisite . . . light weight, self-insulation, and attractive surface lustre . . . is used for a one-piece radio housing.

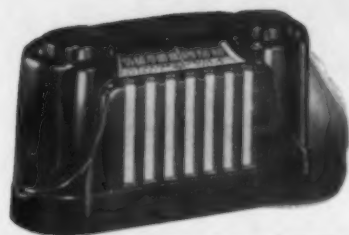
ELECTRICAL STRENGTH Automotive distributor caps are among the many applications requiring the high electrical resistance of this Durez group.

IMPACT STRENGTH In heavy-duty industrial applications such as telephones, camera cases, and machine parts, Durez combines mechanical strength with excellent wear resistance.

HEAT RESISTANCE Use of Durez for welding-gun housings demonstrates the efficacy of the heat-resistant phenolic compounds.

CHEMICAL RESISTANCE High resistance to alcohol, solvents, and many other chemicals makes certain types of Durez best for closures and other packaging applications.

SPECIAL PROPERTIES Success in rayon processing equipment parts, acid pump impellers, automotive water pumps, and marine pump housings suggests consideration of Durez wherever special properties are needed.



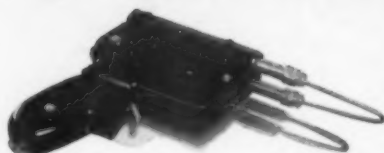
LOW-COST PRODUCTION



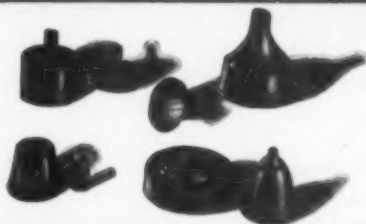
ELECTRICAL STRENGTH



IMPACT STRENGTH



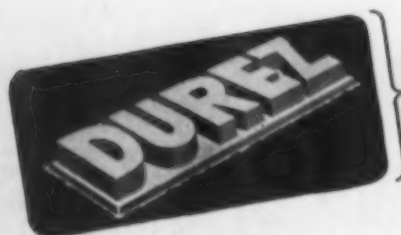
HEAT RESISTANCE



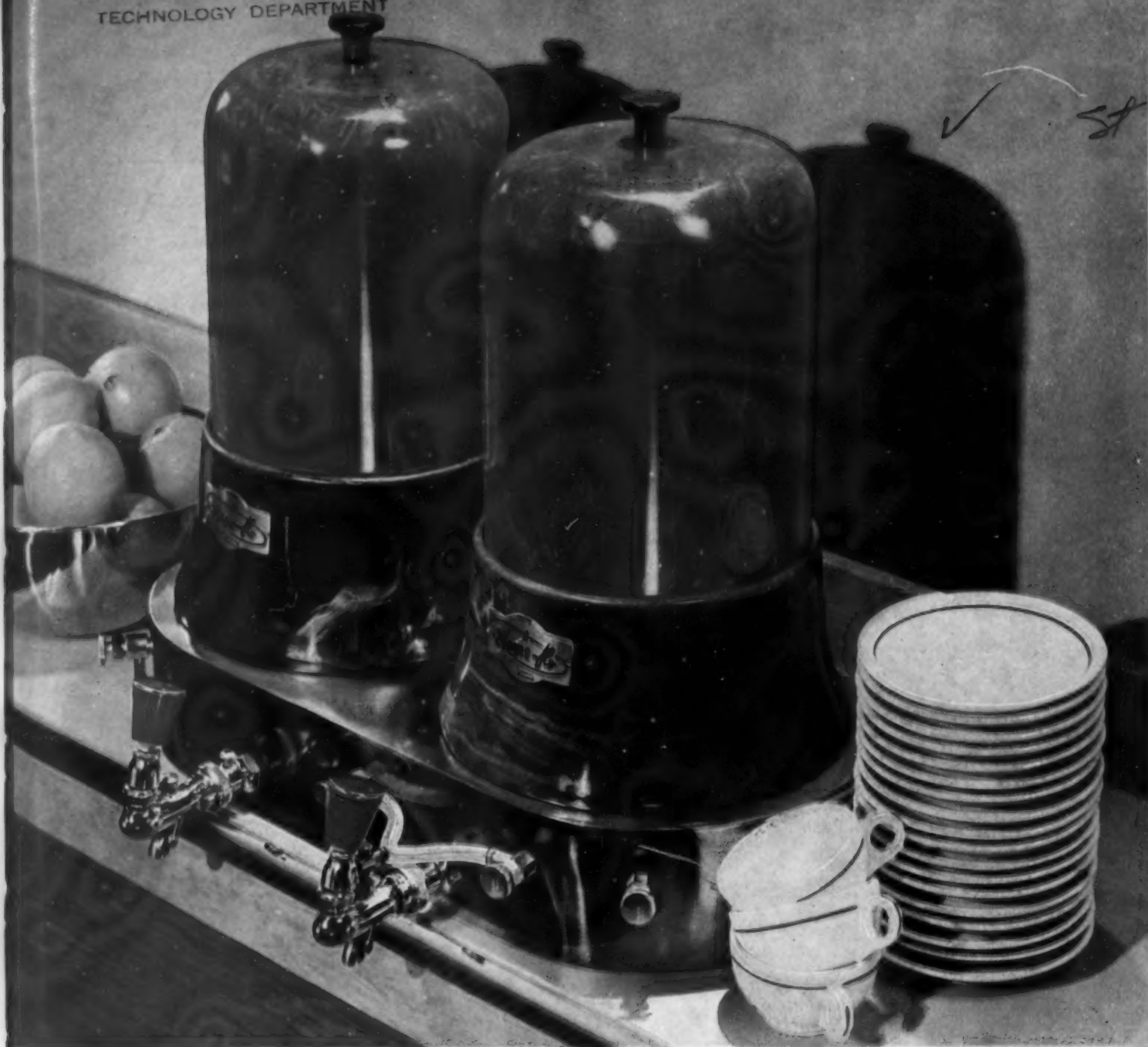
CHEMICAL RESISTANCE



SPECIAL PROPERTIES



PHENOLIC PLASTICS that fit the job



COFFEE...CREAM...AND *Catalin* "TO SWEETEN" THE SERVICE

Catalin now makes its bow at favorite eating spots, drawing coffee—and new friends! The presence of Catalin's rich color and polished brilliance creates an air of charm and cheery welcome as it enhances the Magic-Flo Coffee and Cream Dispenser.

Magic-Flo provides a new and better way to dispense coffee . . . serves coffee to suit individual tastes, either black or perfectly blended with cream, from the same tap . . . saving time, labor and materials. The same type of sound product planning which resulted in the development of the unique Magic-Flo two-way valve led to the selection of Catalin to enhance and to serve in this attractive modern unit.

The twin domes of Magic-Flo house separate supplies of coffee and cream

Catalin's thick, heavy, *cast* wall-sections provide the necessary insulation for the chilled cream compartment and the needed strength to withstand frequent handling. The eight gleaming Catalin parts in the assembly—knobs, domes, bases and tap handles—will not rust, stain, or lose their lustrous sheen. Magic-Flo found that only in Catalin could it obtain the perfect blending of the decorative and functional qualities meeting their requirements.

Because it adapts itself perfectly to modern styling, has an unrivalled richness and depth of color and many desirable physical qualities, product designers continue to find new uses for Catalin in many fields. Tooling costs are low, and highly developed casting techniques now offer full freedom of design

expression in all three dimensions. No other thermosetting material offers Catalin's rich range of stable color and speed of availability.

A get-together with our service staff will quickly reveal how Catalin will blend perfectly with your new product planning. Inquiries invited!

CATALIN CORPORATION OF AMERICA

ONE PARK AVENUE • NEW YORK 16, N. Y.

Magic-Flo Dispenser Unit manufactured by Harr Valve Company, Newark, N. J. Catalin elements fabricated by Acryliform Plastics Corp., Newark, N. J.



MODERN PLASTICS



VOLUME 25

JANUARY 1948

NUMBER 5

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Backyard Ocean

... a foot deep

Another interesting application of Geon polyvinyl materials

THIS "ocean" is constructed from an unsupported sheet of plastic material made from Geon polyvinyl resins. This plastic offers a combination of properties which could hardly be obtained from any other material. It's waterproof and mildew-proof—and it's smooth, flexible, tough, and long-lasting.

Such qualities make the Geon materials equally suitable for wire insula-

tion or clothesline or upholstery. In fact, no one has yet been able to predict how many practical, money-saving, quality-improving or cost-cutting things Geon can do. This we know: Just as it adds to children's fun and safety in the back yard it can create new benefits to consumers and new markets for manufacturers.

How can you use Geon? It can be extruded, pressure or injection mold-

ed, used as a coating for paper or textiles, calendered or cast into sheets or film.

We make no finished products from GEON—or from any of our other raw materials. However, we will be glad to work with you on any special problems of application. We are particularly interested in developing new end uses for these materials. For more information please write Department O-1, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio.



Boltaflex Plastic for Kiddie Pond manufactured by Bolt Products Sales, Inc., Lawrence, Mass.

B. F. Goodrich Chemical Company

A DIVISION OF
THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

JANUARY • 1948

3



A NEW WEIGH TO INCREASE SALES WITH—



Here's maximum effectiveness in point-of-sale advertising . . . an illuminated plastics sign on the customers' side of the new model "Sanitary" scale made by the Sanitary Scale Company of Belvidere, Illinois.

Supplanting metal and glass, this new sign is injection molded in one piece from clear, sparkling polystyrene. The words, "Special Today" are in black and the arrow in red. A supply of changeable insert signs in plastics are also furnished showing various specials, or the storekeeper can write-in the feature of the day with crayon. Users like this novel feature for it has proved to be an effective on-the-spot sales builder.

This new sign is a Chicago Molded job, of course . . . produced entirely in our own plant . . . design, molds, molding, and finishing. And not only is it lighter, easier to handle, and less liable to breakage than the old sign, but it is also more economical to produce because of its simple, one-piece construction.

This is just one more example of doing a job better and more economically with molded plastics . . . the kind of work Chicago Molded is doing continually for hundreds of America's leaders of industry. If you're considering the use of molded plastics you'll find it worthwhile to discuss your plans with a CMPC Service Engineer. Why not write or phone today? There's no obligation.



**CHICAGO
MOLDED
PRODUCTS
CORPORATION**

1046 N. Kolmar Ave.



Chicago 51, Illinois

Representatives in principal industrial centers

COMPRESSION and INJECTION molding of all plastic materials

MODERN PLASTICS*



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Promotion Manager: JOHN G. KASTEN
Production Manager: DANIEL M. BROADS
Ass't. Production Manager: B. J. FARINA
Executive and Editorial Offices:
122 E. 42nd St., New York 17, N. Y.
Tel., MUrray Hill 3-0655

Circulation Department
Circulation Manager: FREDERICK A. KLEIN
32 Broadway, New York 4, N. Y.
Tel., WHitehall 4-4782

Branch Offices

Chicago 1: 221 N. La Salle St.
Manager: J. M. Connors
Tel., RANDolph 5588

Cleveland 14: 815 Superior Ave.
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Tel., SUPERior 0737

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Time out to take stock

Year's end and the start of a New Year form a pin-point in time which has become traditional for inventory, for review, for making good resolutions for the coming months. As such, the beginning of 1948 is of particular significance to the plastics industry.

Throughout the reviews of 1947 published in this issue, covering every phase of the plastics industry from the general business situation through raw materials, applications, engineering, technical, and merchandising progress, there runs the inevitable note of pessimism regarding the early part of the year just finished, plus a heartening note of optimism for the immediate future. MODERN PLASTICS' own surveys of accomplishments and predictions of things to come show a healthy growth in store for the industry. The report on expansion of raw materials production facilities alone gives the key to what the future holds if the industry follows through as it can and will.

S.P.I. President Clark, page 76, touches upon the problems of misapplications and over-production—problems which we are sure the industry as a whole is solving individually and collectively and which will rapidly drop into the background as time goes on. Actually they are not problems as such; rather they are peculiar phenomena which, like toadstools, rear their ugly heads for a short period of time and then disappear, cut down by the sun of common sense, public demand and acceptance, and good merchandising practices.

For too long a period of time plastics have been looked upon as substitute materials, as replacements to be used when other sources fail or are diverted to more essential channels. The late unlamented war gave plastics a chance to prove themselves in a number of applications but also opened the gates to "muggers" who took advantage of the situation and gave plastics a black eye which is only just now beginning to lose its purplish tinge.

As the New Year dawns, all this is changing. Producers of raw materials have come to realize that their future depends upon a flow of plastics products through the right channels to the consuming public. Plastics engineers have learned that the materials with which they are working are not heaven-sent, that they can be used or abused according to the end in sight.

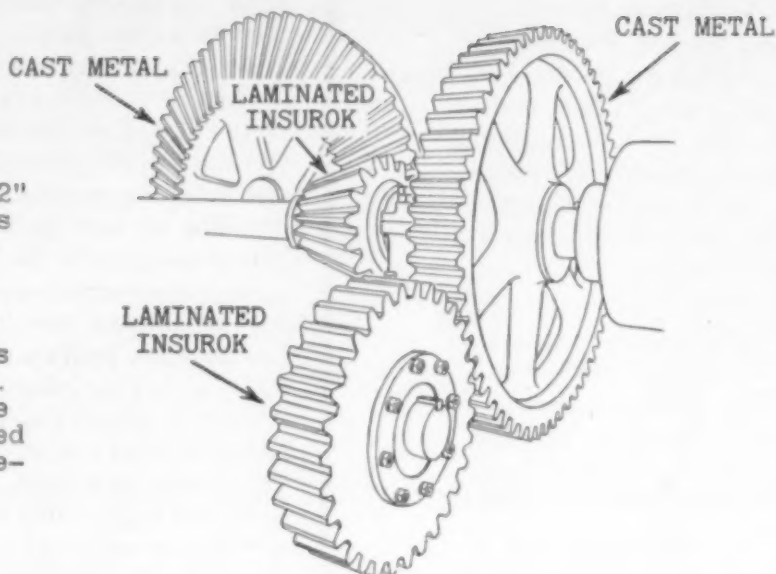
The fields in which plastics can find profitable application spread through all industry. As articles in this issue point out, the construction industry in all its ramifications can make use of untold tonnages of plastics. So can the automotive industry, the electrical industry, the toy industry, the refrigerator industry, and every other producer of industrial and consumer goods, both light and heavy. There is no end to the uses of plastics, not as replacements, not as substitutes, not as alternates, but decidedly as materials which offer characteristics and availability unattainable with metals, wood, leather, fabrics, and the like.

Never before in the short history of plastics have they had such an opportunity to prove themselves as they have today. Raw material sources are expanding, engineering and technical data are accumulating, merchandising knowledge is advancing. Wrap these factors up in a package and you have the ingredients of a whole new world which plastics can conquer to the best advantage of all concerned.

Problems Solved by Richardson...in plastics

#4 Noise reduction through use of plastic gears

PROBLEM: A cast-metal gear assembly forming the back-drive of a 132" paper board machine was creating an almost unbearable screech and howl - so much in fact that the effect on the nerves of the employees was slowing production. Furthermore, teeth were frequently being sheared from the spur pinion because of tremendous back-lash.



SOLUTION: Richardson Plasticians were called in. They redesigned the tooth structure on the entire gear assembly, and installed a Laminated INSUROK spur pinion and beveled gear, each to mate with a metal gear. This was so satisfactory that all back-drive assemblies on this machine, as well as on similar machines in other plants, were changed to conform.

Result:

- (1) Stripping of teeth completely eliminated.
- (2) Less wear and longer life for all gears in the assembly.
- (3) Elimination of approximately 80 per cent of the noise.
- (4) Greatly improved working conditions.
- (5) Increased daily production.

INSUROK Precision Plastics

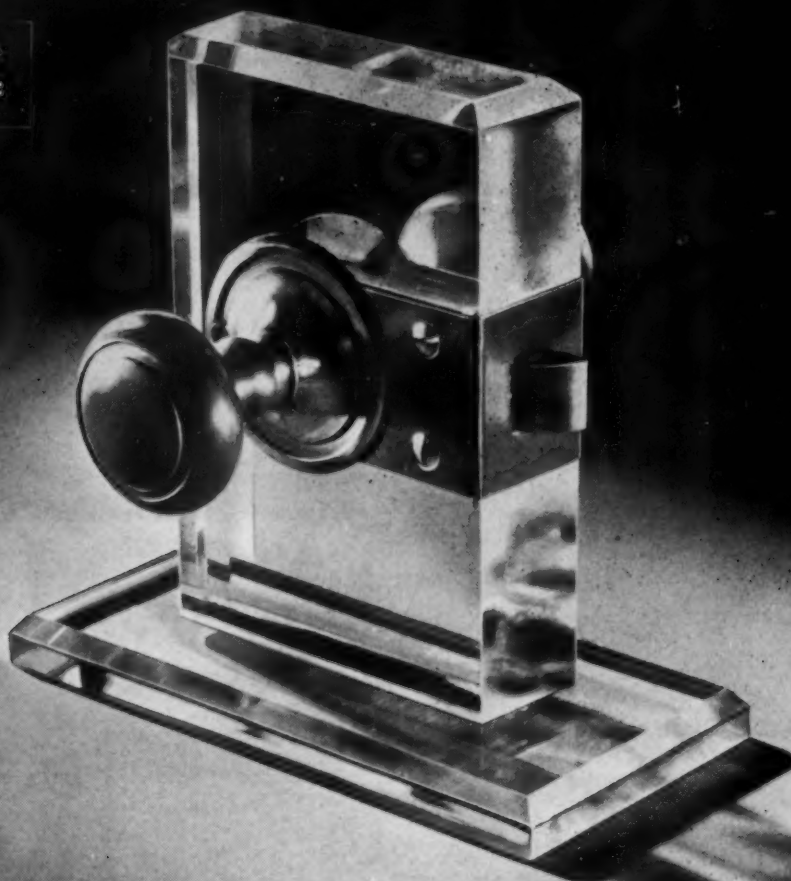
INSUROK is the name of industrial laminated and molded synthetic plastic products produced by Richardson. Laminated INSUROK is available in sheets, rods, tubes, punched and machined parts, made with paper, fabric, glass, etc. Molded INSUROK products are made from Beetle, Bakelite, Plaskon, Tenite, Styron, Durez, Lucite, etc., by compression, injection and transfer molding.

The RICHARDSON COMPANY

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RICHARDSON MEANS *Versatility* IN PLASTICS

Another new product
from a Du Pont Plastic



OPENS THE DOOR TO MORE SALES

Lock sells itself... in appealing counter display of "Lucite"



SIGN SELLS, TOO...

Again "Lucite" flags the shopper's eye at point of sale. This time it's a counter sign made of transparent "Lucite." Because of the ability of "Lucite" to "edge-light," only the engraved sales message glows—illuminated by light in the base. "Lucite" is easily engraved, silk screened, and machined. Sign fabricated by Ranger-Tennere, Inc., New York.

Seen from any angle... this smart silent salesman builds sales through self-demonstration. Unusual features of the Acme Unit Lock are dramatically displayed in its sparkling mounting of clear "Lucite" acrylic resin. Out on the counter, or in the window—it means more buying interest with less sales effort.

Developing the lock mounting after careful investigation of other materials, Mastercraft Plastics Company have used their experience in the fabrication of "Lucite" to provide Acme Hardware Corporation with a brand-new eye-catching display for hardware stores.

For effective merchandising... and smart packaging, too... more and more manufacturers are turning to Du Pont "Lucite." It's available in many colors, transparent, translucent, or opaque. "Lucite" is light, durable, chemically inert... resists both shattering and breakage. It is easily and economically

fabricated or molded.

Perhaps you can profit with a Du Pont plastic... in developing a new product or improving an old one. Write for literature. E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Room 361, Arlington, N. J.

Display unit made by Mastercraft Plastics, Jamaica, N. Y., for Acme Hardware Corporation, Ozone Park, N. Y.



IT'S *Results* THAT COUNT in INJECTION MOLDING!



New home of aaRBee Plastic Co., Los Angeles, Calif.

Popular Reed-Prentice 10D-8 Oz.
model injection machine.

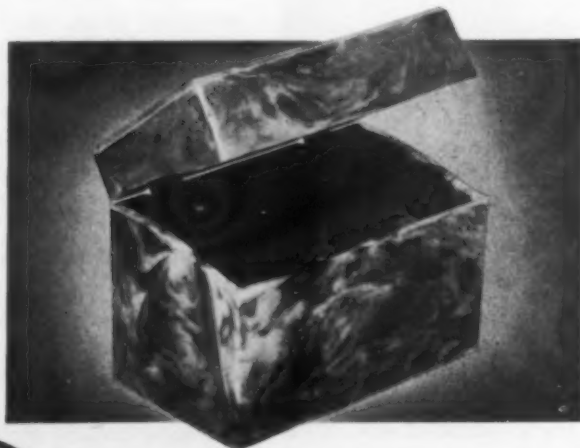


REED-PRENTICE is proud of the fact that the aaRBee Plastic Company has grown out of its boots in two short years . . . particularly since Reed-Prentice machines are used exclusively for injection molding.

Strength and beauty characterize this attractive plastic card index box. The box and cover, molded on the 10D-8 Oz. model weighs 9 ounces, has a wall thickness of 3/16 inches and a complete mold area of 104 square inches. Commenting on the job, the molder states: "Frankly, we did not think it was possible, but as the old saying goes . . . the proof of the pudding is in the eating!"

Among the features of Reed-Prentice plastic injection molding machines which make possible an unusual job of this type is the plasticizing capacity of the heater. In order to thoroughly fill the deep, thick sections, heat control of the material must be accurate and the accuracy must be maintained through the injection period in every cycle. Other important factors are correct pressure on the material and accurate control of cooling time.

All Reed-Prentice injection machines are built to correlate the three most vital molding variables — time, temperature and pressure! You'll find a model to meet *your* requirements . . . available in 4, 8, 10, 12, 16 and 22 Oz. capacities. Write Dept. D for complete machine and mold information.



**THE WORLD'S LARGEST MANUFACTURERS
OF INJECTION MOLDING MACHINES**



NEW YORK
75 West Street

CLEVELAND
1213 W. 3rd Street

LOS ANGELES
2328 S. Santa Fe Ave.

What's in Back

OF THE BEST HAIRBRUSHES

and why?

There's more to a good hairbrush than just the bristles!

The brush block, the handle, the design and color all contribute to the final result. . . the right material is the key to hairbrush quality and long wear, especially when the right material is the economical material. That's why Lumarith* is being used in increasing quantities by big name brush manufacturers.

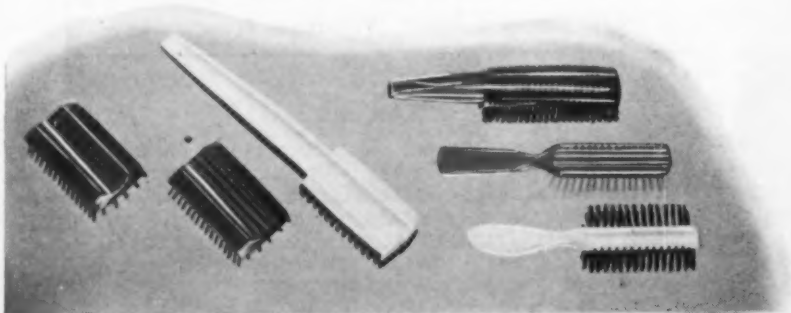
Lumarith:

- is unexcelled for color transparency
- can be molded in heavy cross sections
- does not fracture or craze when drilled or machined
- gives excellent bristle retention
- is chipproof and splitproof
- is resistant to hot water
- is not affected by hair oils and dressings

Are these Lumarith qualities the same qualities you need to make your product a better one? If you're making a personal use item, an appliance, a housing, a toy or a household product, consider the advantages of using Lumarith or one of the other tough Celanese* cellulosic plastics.

SEND FOR "THERE'S A RIGHT PLASTIC FOR EVERY JOB"

CELANESE CORPORATION OF AMERICA,
Plastics Division—Dept. D-1,
180 Madison Avenue, New York 16, N. Y.



Brushes of Lumarith are molded by . . . Fuller Brush Co., Pro-Phy-Lac-Tic Brush Co., Vulcanized Rubber & Plastics Co., Tek-Hughes, Inc. and Gibson-Thomsen Co., Inc.

LUMARITH*
*Celanese** CELLULOSIC PLASTICS
LUMARITH* FORTICEL*
CELLULOID* VIMLITE*

CELCON*

*Reg. U. S. Pat. Off.

Utilize Standard Equipment

FOR SYNTHETIC FABRIC PROCESSING

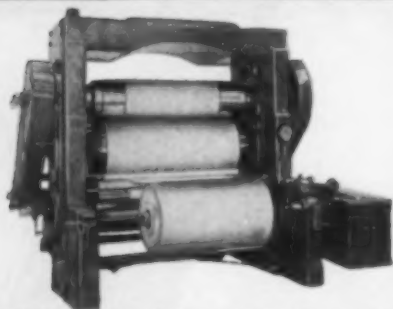
SAVE DESIGNING COSTS

SAVE COST OF ERRORS

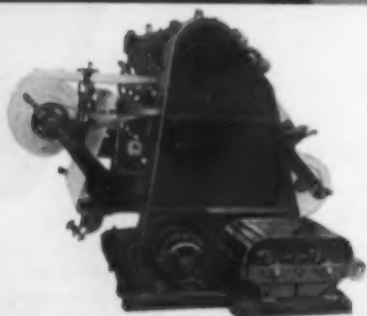
SAVE TIME



TUBING MACHINE Constant speed tubes can be operated up to 200 yards per minute. Movable carriage facilities selvage alignment. Speed is constant at all times and adjustable tension arrangement is provided. Accurate measuring obtainable. Interleafing attachments.



CALENDERING Calendering machines for synthetic fabric processing are available in many different types and all tonnages. These machines work exceptionally well for chloride monofilms and Saran. All designed for cold or hot calendering.

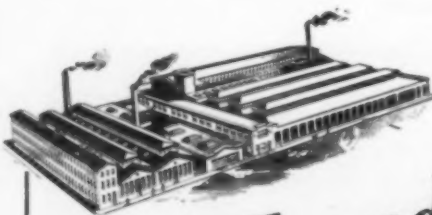


EMBOSSING — Two or three roll embossing machines are available in both male and female types. Rolls can be quickly interchanged. Made in hydraulic, lever or screw types.

If you intend to process synthetic fabric or wish to modify your present synthetic fabric production, you should investigate the possibilities of utilizing our standard processing machines.

Over a period of years, we have become the world's largest manufacturers of textile processing machinery. This rich background in design and production saves time, errors and expense of designing new equipment where existing equipment does the job.

Write us about your specific problem. We manufacture many different types of machines for processing textiles and synthetic fabrics and we are reasonably sure that we can fulfill your requirements.



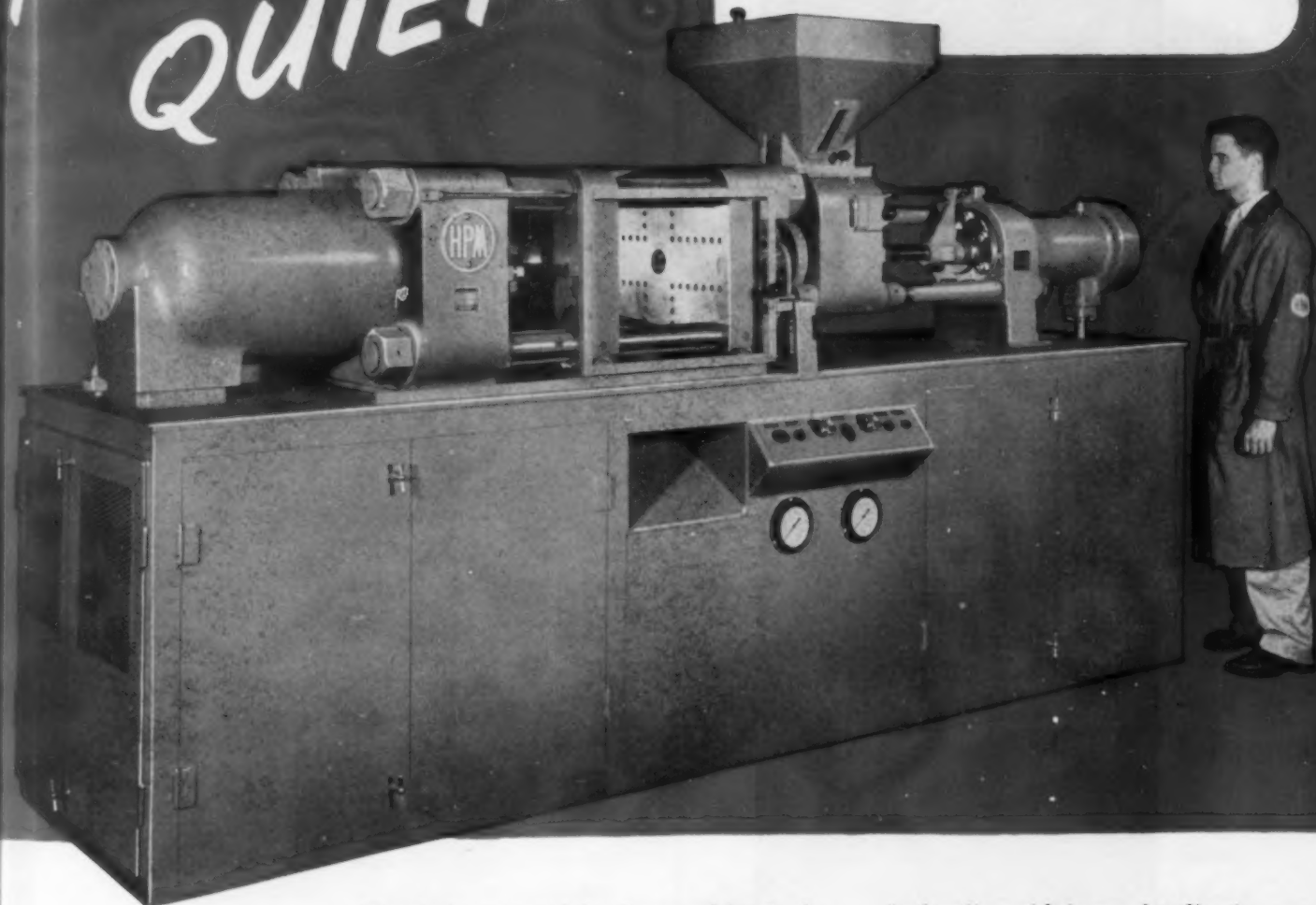
Van Vlaanderen
MACHINE COMPANY

370 Straight Street, Paterson, New Jersey

BLEACHERS • BREAKERS • CALENDERS • CALENDER DRYERS
CONTINUOUS WASHERS • COOLING CYLINDERS • COTTON BACK FINISHER DRYERS — ALL TYPES • DYEING MACHINES • ELECTRIC
GUIDERS • EMBOSSING MACHINES • EXPANDERS • EXTRACTORS • FLOCK PRINTING MACHINES • GLASS CLOTH HANDLING EQUIPMENT
• HEATING TOWERS • HYDRAULIC CALENDERS • IMPREGNATING MACHINES • MANGLES • MEASURING MACHINES • MIXING KETTLES
• PAD DYEING MACHINES • PRINT WASHERS • ROLLING-UP MACHINES • ROLLS — RUBBER — PAPER • SINGEING MACHINES • SLACK
PRINT WASHERS • SOAP WASHING MACHINES • SQUEEZERS • SUCTION MACHINES • TENSIONLESS CONSTANT SPEED DYE JIGS •
ENTER FRAMES • TUBING MACHINES • WINDERS •

*Faster-Simpler-
QUIET!*

**The New H-P-M
All-Hydraulic 4 oz.**



Complete information on the new H-P-M 4 oz. injection machine is contained in Bulletin 4701. Write us for your copy.

Here's the newest injection machine in the plastics industry—and the simplest. It's the first *all-hydraulic* injection machine with a one-pump system. This means there are less things to go wrong—fewer moving parts to wear or break—fewer adjustments. You'll have less maintenance—and simpler, safer operation.

But that's just *one* advantage of this new H-P-M unit. H-P-M design gives you fast plasticization with two zone electric heat—positive mold sealing with straight-line

hydraulic mold clamp—fast die-change-over—round-the-clock high-speed operation.

When you buy H-P-M machines, you're buying 70 years' experience in hydraulics—and a power system built by H-P-M engineers. Responsibility is undivided. "All-Hydraulic" units are built in standard sizes of 4, 9 and 16 ounce capacity. Investigate now, while deliveries are still favorable. An H-P-M engineer will gladly explain their money-saving production features—as applied to your work.

THE HYDRAULIC PRESS MFG. CO., 1010 Marion Road • Mount Gilead, Ohio, U. S. A.
Branch Offices: New York, Cincinnati, Cleveland, Columbus, O., Detroit, Pittsburgh, Chicago. Representatives in other principal cities.
Export Dept.: 500 Fifth Avenue, New York, N. Y. Cable—"Hydraulic"

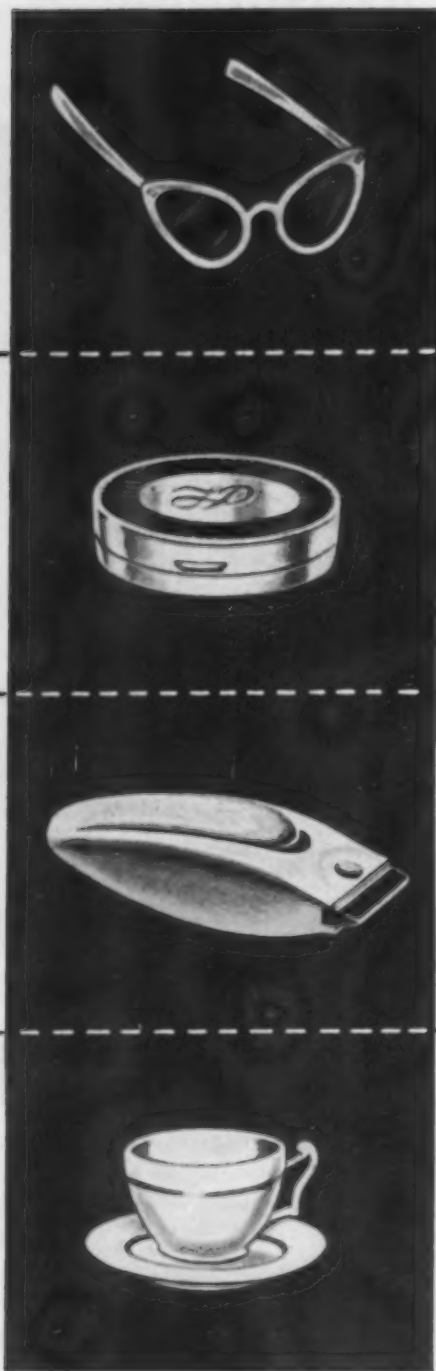


*All-Hydraulic
Self-Contained*

Injection Machines
FOR MOLDING THERMO-PLASTICS

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

TITANOX . . . *the brightest name in titanium pigments*



TITANOX
pigments
make for a
bright white
or pleasing pastel
in plastics...

Compounders find that TITANOX pigments impart maximum whiteness to plastics. They also assure an attractive pastel tinted product — one that stays good-looking a long time.

There's another reason why the plastic industry is turning to this "brightest name in titanium pigments". TITANOX pigments control the degree of translucency or gives complete opacity, as desired.

The unusually great demand for these famous titanium pigments makes it difficult for us to fill your requirements completely. So we must ask your patience if we are unable to supply all you need.

TITANOX

Reg. U. S. Pat. Off.

111 Broadway, New York 6, N. Y.
164 So. Michigan Ave., Chicago 3, Ill.

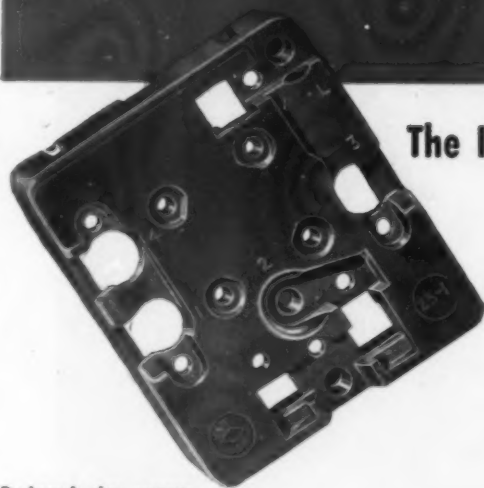
TITANIUM PIGMENT CORPORATION
SOLE SALES AGENT

350 Townsend St., San Francisco 7, Cal.
2472 Enterprise St., Los Angeles 21, Cal.



This
 (2 1/2" x 2 1/2" x 1 1/4")
**"Assembly
 Hall"**
 provides "reserved
 seats" for all parts
 in "Diamond H"
 Thermostats
 (Types 25 and 252)

Interior, same-size
 view of housing molded
 for the "Diamond H" Ther-
 mostat, as designed by
 and produced for
 The Hart Manufac-
 turing Company,
 Hartford 1, Connecticut.



Reduced size repro-
 duction — Front face of
 "Diamond H" Thermostat
 Housing.

**The Intricate Specifications for the Front, too,
 Required Strict Adherence to Closest Tolerances**

To best appreciate the intricacies of exterior and interior pattern involved in a thermostat base, you must see it as we show it here — before the multiple of electrical components take their allotted positions. Here, one structurally strong piece of molded phenolic with insulating qualities provides, to exacting precision, each specified requirement as to holes, recesses, elevations, slots and wall thicknesses.

It exemplifies the type of molding in which Consolidated excels. Through experience, as pictured hereon, Consolidated is able to successfully and consistently solve broadly diversified industrial problems. We are confident that this evidenced know-how can be advantageously applied to your particular planning. Our sales engineers are readied to serve your inquiry.



PRODUCT DEVELOPMENT • MOLD DESIGN • MOLD CONSTRUCTION • PLUNGER MOLDING • TRANSFER MOLDING • INJECTION MOLDING • COMPRESSION MOLDING
 Branches: NEW YORK, 1790 Broadway • CHICAGO, 549 W. Randolph St. • DETROIT, 550 Macabees Bldg. • CLEVELAND, 4614 Prospect Av. • BRIDGEPORT, 211 State Street.

Now Available *in* **SOLID COLORS**

25 Pastel Shades

FARLITE

REG. U. S. PAT. OFF.

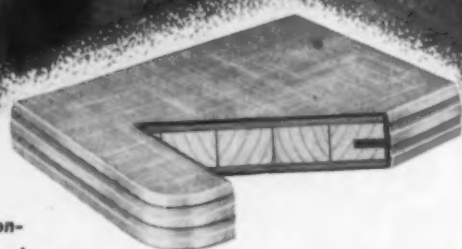
Laminated

PLASTIC TABLE TOPS

Here's the good news you've been waiting for—because it's the way to add new sales appeal to your tables. Pastel shades in blues, greens, reds, yellows, etc. offer you choice of a solid color that will harmonize with any color scheme.

In addition to solid colors, FARLITE is available in decorative designs of marble, wood grains, linen, etc. It is time-tested under most severe conditions. It has proven its excellence and continues to win new markets and expand present fields.

Write today for full details.



5-ply, cross-banded construction. Edges trimmed with FARLITE or metal.

PLASTICS DIVISION
FARLEY & LOETSCHER MFG. CO.
DUBUQUE, IOWA

CAPACITY PRODUCTION

Here's a new high in Polystyrene molding. And it's consistently being maintained on the new Watson-Stillman "COMPLETELINE" Injection Molding Machines with improved heating cylinder design. Molders now get *full capacity shots* of "de-rating" materials without stuffing or interruption of automatic production cycles.

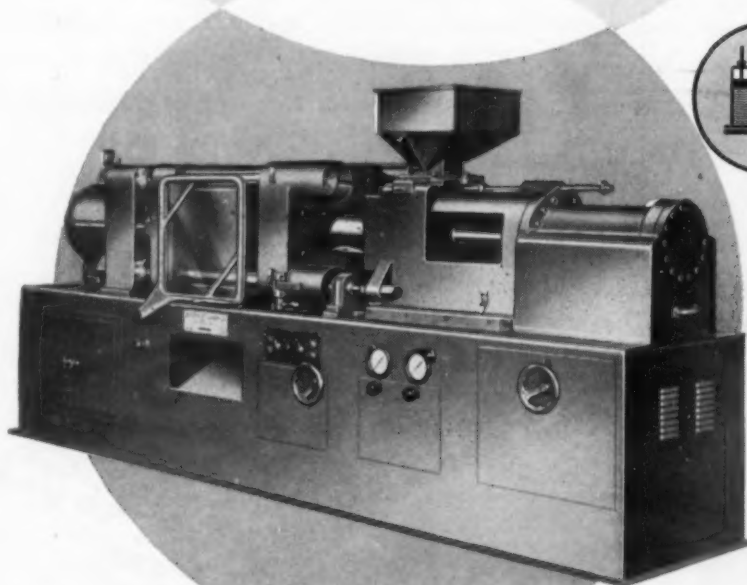
Do tricky, hard-to-handle compounds de-rate your machines and require manual cycling? Then you'll want all the facts about these "big-shots" . . . in 4 to 80-oz. sizes. Write for "COMPLETELINE" bulletin 620-D. For further details, see the Watson-Stillman agent nearest you.

**11½-oz. POLYSTYRENE box
on 12-oz. machine**

Production Cycle—less than 1 minute



Creative merchandising for Three Feathers—this gift box was custom-molded of polystyrene by Cowan-Boyden Corp. on a Watson-Stillman 12E-275 Injection Molding Machine.



WATSON-STILLMAN

FACTORY AND MAIN OFFICE

Roselle, New Jersey

BRANCH OFFICES

Philadelphia, Pa. • Chicago, Ill.

REPRESENTATIVES

BIRMINGHAM 3, ALA.	George M. Meriwether
BUFFALO, N. Y.	Industrial Equipment Co.
CHICAGO, ILL.	E. L. Essley Machinery Co.
CLEVELAND, O.	Frank T. Goetz Machinery Co.
DALLAS, TEX.	Perry Machinery Co.
DENVER, COLO.	Overgard Machine Tool Co.
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SYRACUSE, N. Y.	Industrial Equipment Co.
TULSA, OKLA.	Perry Machinery Co.

Foreign Sales Representatives:

OMNI PRODUCTS CORP., 460 Fourth Ave., N.Y. 16, N.Y.

Correspondents Throughout the World

MANUFACTURERS OF THE MOST
COMPLETE LINE OF HYDRAULIC MACHINERY

Put 'em together Right

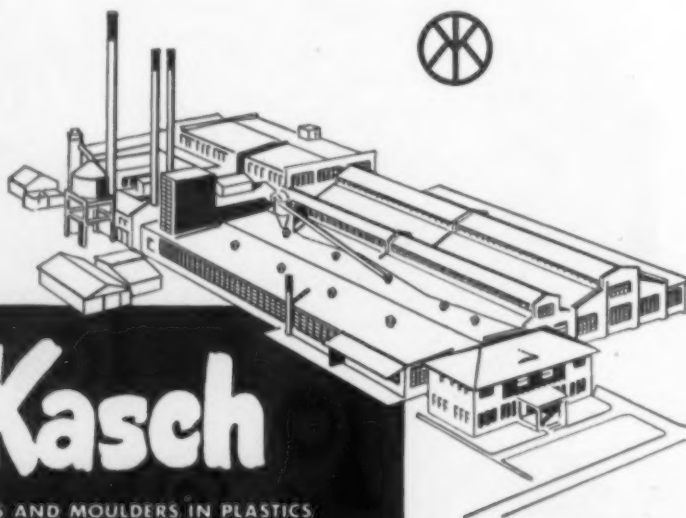


...and there's your plastic part!

BETTER YET, let *us* do it. Timing and executing all the steps that go into plastic production calls for an experienced hand. So it's no puzzle to us. We're veterans in the industry—we can show you a nice bright accomplishment record along with a long list of satisfied customers—we've got the plant, personnel and equipment to do a good job at a fair price—and we're interested in your business.

We offer a self-integrated, dependable source for plastics—complete from design and engineering to cost-conscious finishing equipment. If you've got a compression, transfer, or plunger moulding job, look us up. Question our old customers—or let a Kurz-Kasch sales engineer give you the story.

Kurz-Kasch, Inc., 1415 S. Broadway, Dayton 1, Ohio
BRANCH SALES OFFICES: New York, Lexington 2-6677
 Chicago, Harrison 5473 • Detroit, Randolph 5214
 Los Angeles, Prospect 7503 • Dallas, Lakeside 1022
 St. Louis, Rosedale 3542 • Toronto, Canada, Adelaide
 1377. **EXPORT OFFICES:** 89 Broad Street, New York City,
 Bowling Green 9-7751.



Kurz-Kasch

FOR OVER 31 YEARS PLANNERS AND MOULDERS IN PLASTICS

GLADITE

WONDER PLASTIC OF 1958

...HERE 10 YEARS AHEAD OF TIME

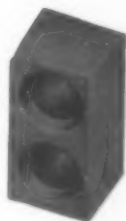
COLD-MOLDING in **COLORS**



Reg. U. S. Pat. Off.

Gladite is a completely new and revolutionary cold molding powder that can be molded into finished plastic parts at speeds as high as 30,000 small units per press per hour. Only one processing operation is involved: the single rapid stroke of a molding press. No pre-heating, no pre-forming, no after-baking steps are necessary.

LEADING MOLDERS NOW USE GLADITE FOR ITEMS LIKE THESE . . .



This is a red Gladite building block. It has high compression strength, good dimensional stability, takes rough usage without scratching or breaking. It's obtainable in any color and any shade you specify.



Here's a cold molded Gladite checker. Items like it can be turned out as fast as automatic presses can operate. Attractive glossy finish is colorfast and highly resistant to abrasion and chipping.



Gladite's excellent dielectric properties, its resistance to temperatures as high as 500°F., make it an ideal material for the mass-production of fuse plugs, insulators, and other electrical components.



Bottle caps of Gladite are proof against water, greases, oils and alcohols. They possess ample strength to withstand the high torques placed upon closures.

And that's not all . . . Gladite overcomes almost every disadvantage which has heretofore limited the scope of usefulness of cold molding powders.

Gladite flows easily. Its bulk factor is unusually low. It can be obtained in *any color*. Each color is fast . . . each is uniform.

And here's another important point. The physical properties of Gladite can be varied by formula to adapt it to specific product uses. It can be provided with specific dielectric properties. Or it can be compounded to withstand temperatures as high as 500° F. We can make it alcohol, water, grease and oil proof.

All formulations possess exceptional compression and tensile strength. All have excellent dimensional stability. And every finished item molded of Gladite has a smooth, lustrous surface that needs no buffing, grinding or polishing.

Important and profitable new uses for this extraordinary molding powder wait only upon the ingenuity of product engineers. If you'd like to test Gladite on your present equipment (either rotary, single-stroke or hydraulic presses) or if you desire to explore its possibilities, write now on your business letterhead for a free sample canister.



Standard shipping container for GLADITE is this sturdy 100 lb. fibre drum.

MYLER PLASTICS CORPORATION

Cold Mold Plastic Powders

92 BISHOP STREET

JERSEY CITY 4, N. J.

STAMP NAMES, TRADEMARKS ON YOUR PLASTIC PRODUCTS

with the simple, easy-to-use
Kingsley

- ★ no skilled operators necessary
- ★ uniform, clean-cut stampings
- ★ up to 1000 impressions per hour

With the small, compact Kingsley Machine you can mark your plastic products in gold, silver or colors right in your own plant.

HOW IT WORKS — The type or die is electrically heated in the machine and stamps through a ribbon of gold or color foil making a permanent impression of unusual beauty and richness — all in one simple operation.

ADDS EYE APPEAL — The fine, precision-built features of the Kingsley insure uniform, clean-cut stampings that add value to your product.



CUT YOUR STAMPING COSTS — SAVE TIME

Write us about your marking requirements. Enclose a sample or dimensions of the part to be stamped; give size of lettering or copy of design and quantities to be stamped. We'll reply by return air mail with complete information on equipment required, production speeds and total cost to you.



RELIABLE PERFORMANCE — When you buy a Kingsley, you get a time-tested machine that has proved itself with 15 years of satisfactory service to thousands of users everywhere.

Kingsley
STAMPING MACHINE CO.

1606 CAHUENGA BOULEVARD • HOLLYWOOD 28, CALIF.

THESE ARE TYPICAL APPLICATIONS





*Nominations are now being accepted
by the committee for*

THE JOHN WESLEY HYATT AWARD

for the advancement of plastics

SEVENTH ANNUAL AWARD

The John Wesley Hyatt Award, consisting of a gold medal and \$1000, is made annually to the individual who has made, in the opinion of the judges, outstanding achievement of wide importance to the plastics industry

ENTRIES

Any person, whether he or she be a molder, tool-maker, laboratory technician, executive, or engaged in any other capacity, is eligible or may submit one or more entries. There is no fee of any kind. Anyone may enter or be entered. Statements of qualification (Entry Blanks) are being mailed to the industry. Additional entry blanks may be obtained from the Committee Secretary, 295 Madison Avenue, New York 17, N. Y.

PREVIOUS MEDALISTS

1941—Dr. Donald S. Frederick, Plastics Division, Rohm & Haas Company, Philadelphia, for adaptation of large transparent colorless sections of

methyl-methacrylate to bombers and other military aircraft.

1942—Mr. Frank Shaw, President, Shaw Insulator Company, Irvington, N. J., for development of the process for transfer molding of thermosetting materials.

1943—Dr. Stuart D. Douglas, Head of Plastics Research, Carbide and Carbon Chemicals Corporation, South Charleston, W. Va., for his outstanding research work in the polymerization of vinyl compounds.

1944—Mr. William Iler Beach, Chief Plastics Engineer, North American Aviation, Inc., Inglewood, Calif., for his research and development on the

process of post-forming phenolic laminates.

1945—Mr. Virgil E. Meharg, Superintendent of Development, Bakelite Corporation, Bound Brook, N. J., and Mr. Paul D. Zottu, Consulting Electronic Engineer, Newton, Mass., for their individual work in developing the use of electronic heating of thermosetting plastic materials.

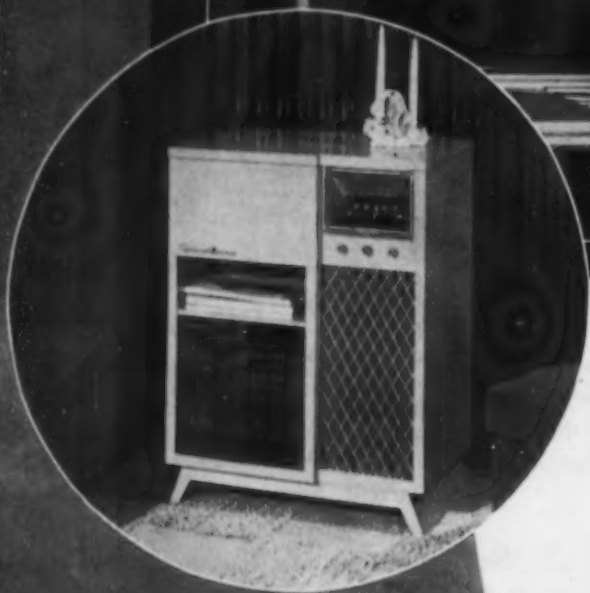
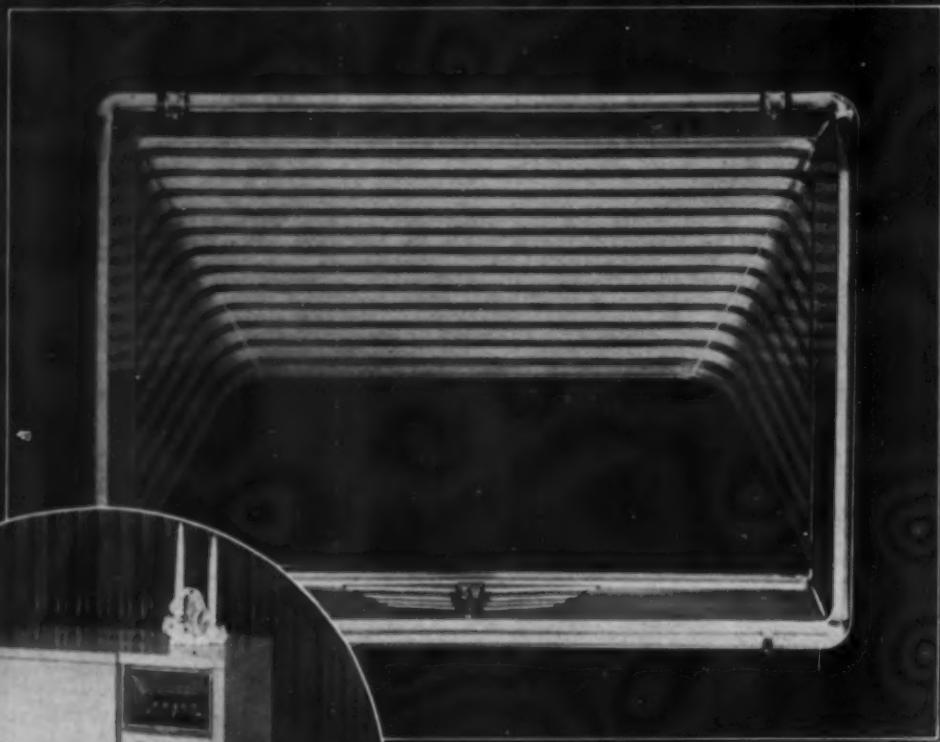
1946—Dr. John J. Grebe, Director of the Physical Research Laboratory, Dow Chemical Company, Midland, Mich., for his work in the production of pure styrene and its polymerization. Mr. Robert R. Dreisbach, Dr. Grebe's associate, was presented with a silver medal for his assistance in this project.

THE JOHN WESLEY HYATT AWARD

Secretary to the Committee

WILLIAM T. CRUSE, 295 Madison Avenue, New York 17, N. Y.

PLASTICS for INDUSTRY



CREATIVE CUSTOM MOLDING

The escutcheon shown is in keeping with the distinctive beauty of the styling and design of the new line of Stewart Warner Radio cabinet models.

Molded in clear methacrylate with the beauty of the fine engraving brought out by gold lacquer, the piece is assembled into the cabinet by means of lugs, set into the mold as inserts. The dial scale is placed back of the clear window and indirectly lighted.

The finished part is one of which both Stewart Warner and Cruver can be proud.



51st Year in Plastics . .
CRUVER

MANUFACTURING COMPANY

2456 W. Jackson Blvd., Chicago, Ill., Seeley 1300

New York - 2 W. 46th St. • Wisconsin 7-8847

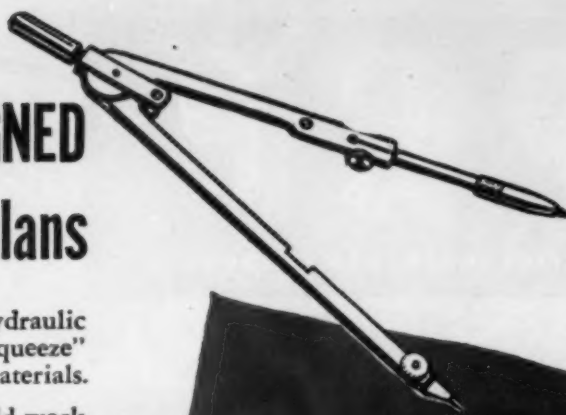
HYDRAULIC PRESSES DESIGNED to fit into your production plans

Here are three examples of the thousands of hydraulic presses we have designed and built for "putting the squeeze" on rubber, plastics, linoleum, tiling, and other materials.

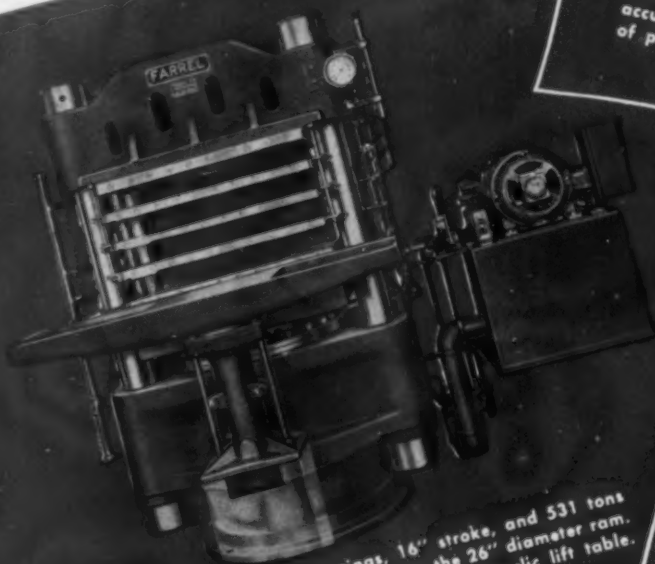
F-B presses range from 12" square for small mold work up to any size required for molding large plastic sections, and for vulcanizing rubber belts, floor tiling, etc. Design and materials provide the strength required for minimum deflection.

They can be made for any pressure and equipped with controls for fully automatic cycle operation or for semi-automatic or manual operation. Presses are equipped with individual pumping unit, integral with the press or mounted separately; or arranged for group operation from central pump and accumulator system.

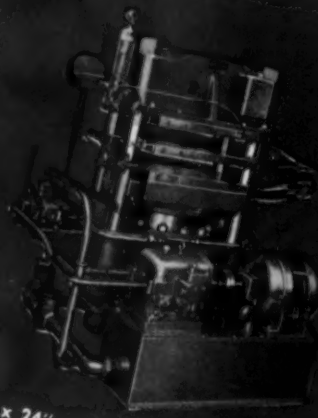
Tell us your problem and ask for information and estimates on presses for your specific requirements.



34" x 42" press with four 3" openings, 12" stroke, and 597 tons capacity with 2250 lbs. working pressure on the 26" diameter accumulator system operating a number of presses.



42" x 42" press with four 4" openings, 16" stroke, and 531 tons capacity with 2,000 lbs. working pressure on the 26" diameter ram. Equipped with individual oil power unit and hydraulic lift table.



24" x 24" press, having two 4" openings, 8" stroke, and a capacity of 177 tons with 2,000 lbs. working pressure on the 15" diameter ram. Equipped with individual oil power unit.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh,
Akron, Chicago, Los Angeles, Tulsa, Houston.



Farrel-Birmingham

FB-418

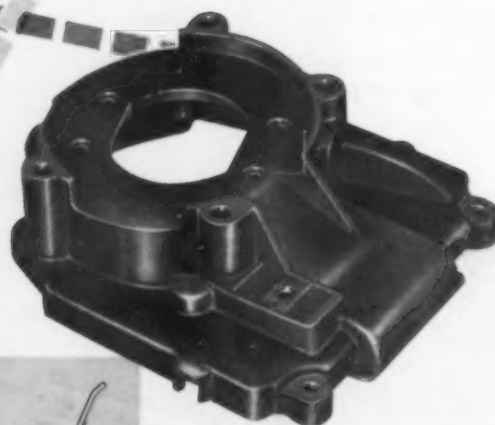


*Produces
Both*

PLASTIC PARTS

hidden

The Hoover Company, well-known manufacturer of electric cleaners, is increasing production, improving product performance, lowering costs by specifying strong, light-weight plastics, wherever possible, for interior parts. Here is a custom molded P R P motor housing, a non-conductor of electricity, ideal for its purpose. This is a typical example of P R P's skill in producing *hidden* parts — important functional parts of a product.

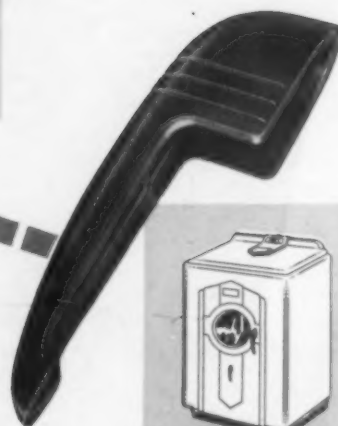


PLASTIC PARTS

Exposed

Here's the door handle . . . attractive, pleasant to the touch, strong . . . of the popular Bendix automatic washer, production of which has passed the million mark. P R P molds this, and other parts for the washer, in quantities geared to the manufacturer's production schedule. There's never a shut-down for lack of P R P parts.

Write today for an account of P R P's experience in producing plastic parts for leading manufacturers in your own industry. No obligation.



PLASTICS RESEARCH PRODUCTS COMPANY

Factory and Office: URBANA, OHIO

Branch Offices: 551 Park Avenue West, MANSFIELD, OHIO

National Bank Bldg., LOGANSPORT, IND.

COMPRESSION, TRANSFER, HIGH SPEED PLUNGER AND AUTOMATIC MACHINE MOLDING

"FASTER four ways"

says
The Rudolph Wurlitzer Co.

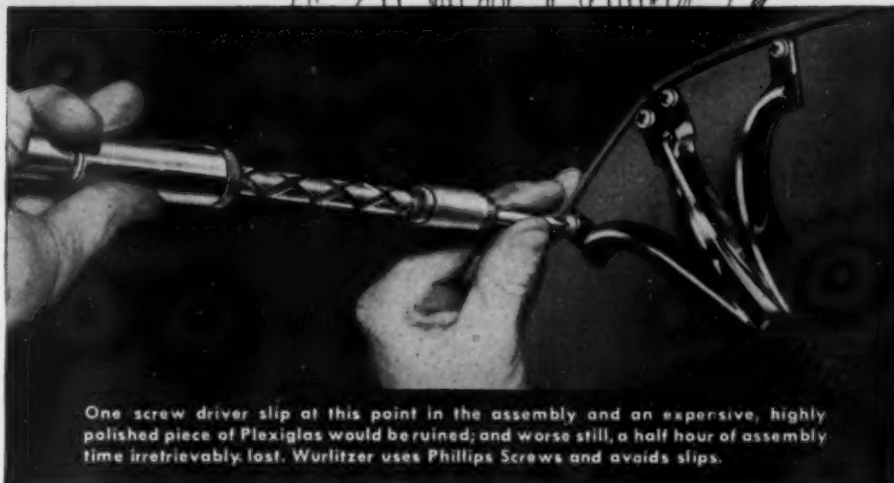


Extracts from another of the series of independent surveys by James O. Peck Co., of assembly savings made with Phillips in leading plants.

"We specify Phillips Screws for our coin-operated phonographs," said Wurlitzer's engineering staff, "because they're faster four important ways.

"Start quicker, drive faster. Although we haven't made actual time studies, it's fairly easy to see how much shorter assembly time is with Phillips Screws. That's natural . . . the perfect fit of the driving bit in the Phillips Recess makes locating the screw and driving it much more positive.

"Tricky assemblies simplified. The firm seat of the driver in the Phillips Recess speeds up otherwise slow jobs such as blind driv-



One screw driver slip at this point in the assembly and an expensive, highly polished piece of Plexiglas would be ruined; and worse still, a half hour of assembly time irretrievably lost. Wurlitzer uses Phillips Screws and avoids slips.

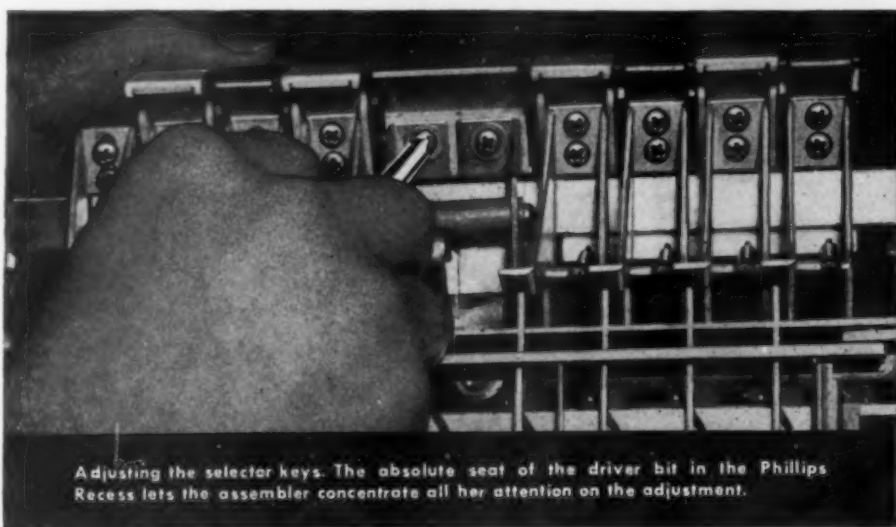
ing, sensitive adjustments, spring assemblies, and driving with jigs.

"No mental hazards . . . steadier work. Inside and out, there are a lot of places where a skidding

screw driver would do a vast amount of harm to these machines. Since that danger is non-existent with Phillips Screws, our assemblers make better time, work more smoothly.

"New help learns faster. Even people who have never driven screws in factory production can be trained to drive Phillips Screws much easier and faster than they could be taught to drive slotted screws. Also eliminated is the danger to hands and arms from jagged, burred heads turned up so frequently on slotted screws. And far fewer screws are dropped on the floor . . . a not inconsiderable saving to us."

Ideas for your assembly operations . . . FREE, in this Wurlitzer report and in other assembly reports . . . covering metal, wood and plastic products. Use coupon.



Adjusting the selector keys. The absolute seat of the driver bit in the Phillips Recess lets the assembler concentrate all her attention on the adjustment.

PHILLIPS Recessed Head SCREWS

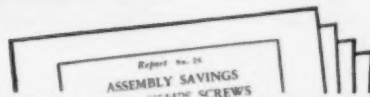
Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of
American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
International Screw Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.

24 SOURCES

National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.

Phell Manufacturing Co.
Reading Screw Co.
Russell Burdall & Ward
Bolt & Nut Co.
Scovill Manufacturing Co.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wolverine Bolt Company



Phillips Screw Mfrs., c/o Horton-Noyes
1800 Industrial Trust Bldg.,
Providence, R. I.

Send me reports on Assembly Savings with Phillips Screws.

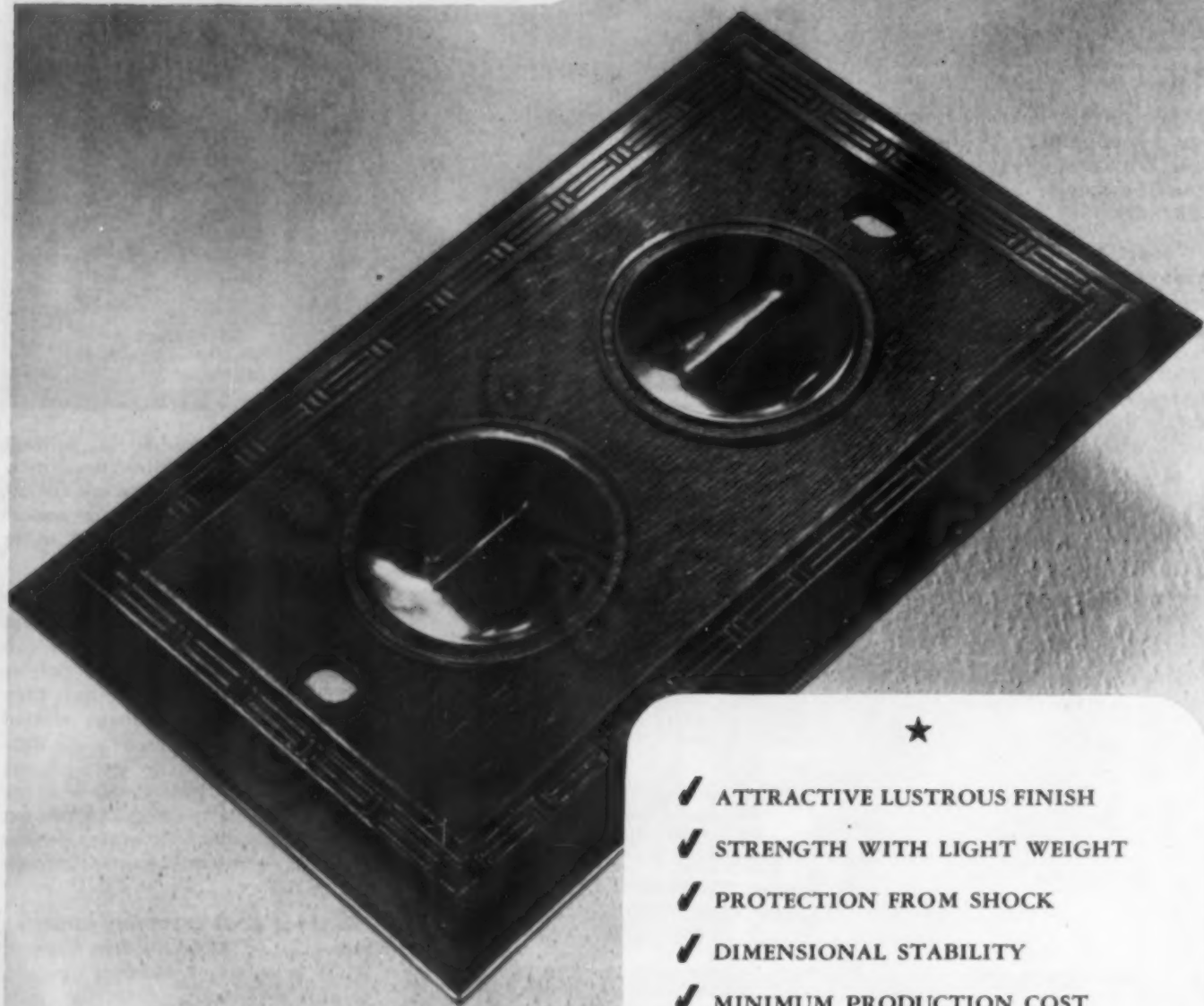
Name

Company

Address

MP-25

DURITE

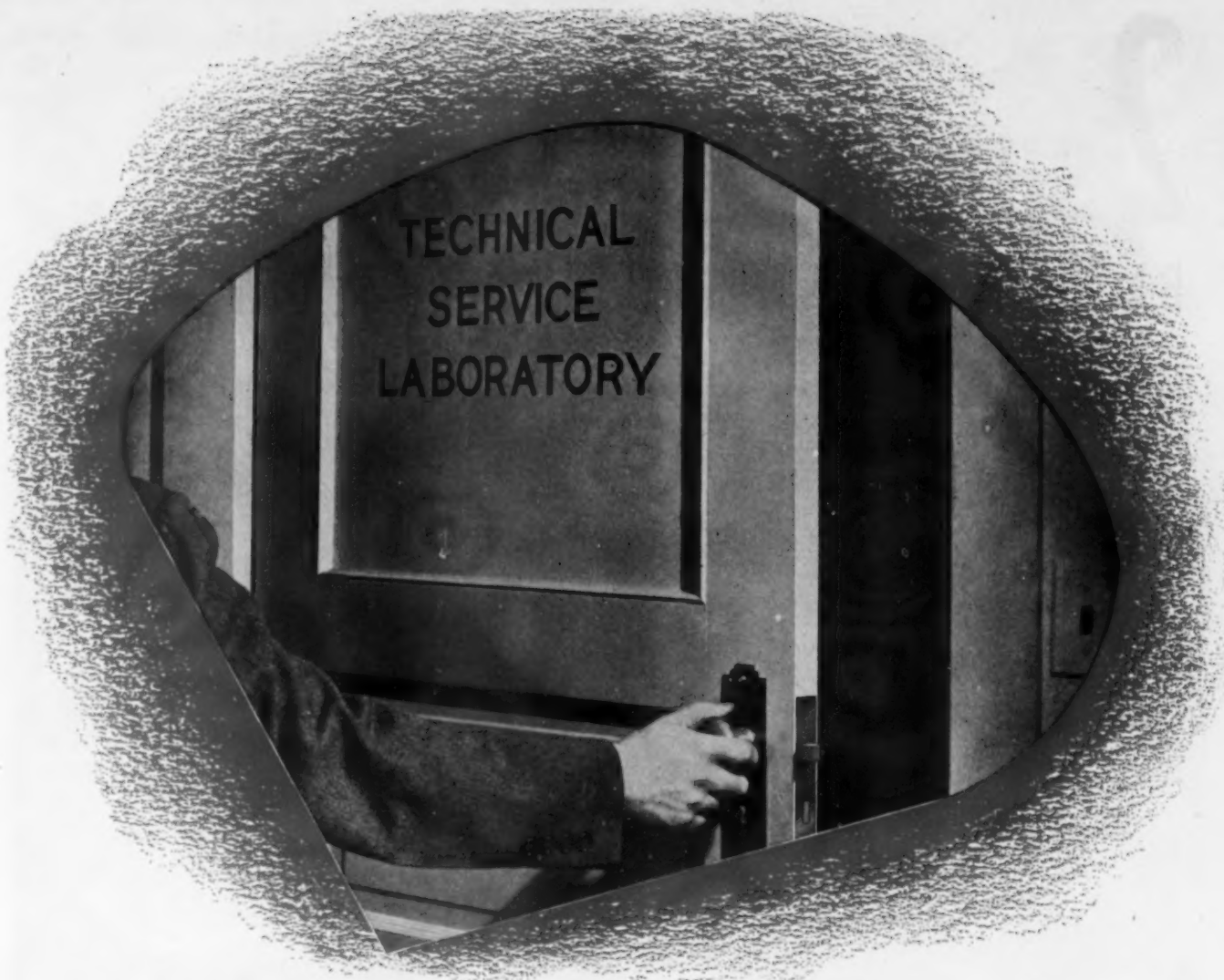


- ✓ ATTRACTIVE LUSTROUS FINISH
- ✓ STRENGTH WITH LIGHT WEIGHT
- ✓ PROTECTION FROM SHOCK
- ✓ DIMENSIONAL STABILITY
- ✓ MINIMUM PRODUCTION COST

These are a few of the important features that lend character to well designed wall plates when molded of DURITE Phenolic Compounds

DURITE PLASTICS

DIVISION OF THE BORDEN COMPANY
5000 SUMMERDALE AVE., PHILADELPHIA 24, PA.



Open door to new extruding techniques

PLASTICS extrusion is still a growing, developing process even though much of yesteryear's experimental work has become today, standard production procedure.

While NRM engineers continue their research and design work on new equipment, they are also still working closely with plastics material suppliers on the handling of new materials and compounds. This keeps NRM in close touch with the

latest advances in the industry ... and in turn, this experience is being made available to you to help you with your problems.

NRM has recently completed the equipping of its technical service laboratory with facilities to bring you an improved and comprehensive testing service.

Here at Akron you'll find the door open to your production problems ... to help you improve present extruding techniques or to find new methods

of processing new materials. NRM's technical service laboratory is equipped to process materials on production type equipment to provide data on mixing, blending, best extruding temperatures, the volume and quality of extrusions under different conditions and other specific information.

To put these facilities and services to work for your benefit, write and let us know how we can best help you.



NATIONAL RUBBER MACHINERY CO.

General Offices: AKRON 8, OHIO

California Representative: Sam Kipp, P. O. Box 441, Pasadena 18, Calif.

Plastics

MACHINERY DIVISION

EXPORT DISTRIBUTORS: OMNI PRODUCTS CORPORATION, 460 FOURTH AVE., NEW YORK 16, N. Y.

JANUARY • 1948

25

2 SHORT CUTS

BY BEHR-MANNING...



...LICKED THIS FLASH-FINISHING JOB

Luster-finishing of plastic gun stocks requires delicate flash removal and carefully blended polishing because sportsmen are usually "cranks" about stock finishes. But fine finishes need not necessarily be costly, as was demonstrated when our Methods Laboratory was asked to study this operation for possible method improvement.

As a result, two simple "short cuts" eliminated an expensive operation, and the entire process, from flash removal to finished stock, was reduced to a one-station job — with a great saving in time and cost.

In the belief that this same methods engineering service may effect comparable economies for you, we invite you to similarly submit samples of your product.

BEHR-MANNING • TROY, N. Y.

(DIVISION OF NORTON COMPANY)



MANUFACTURERS OF QUALITY COATED ABRASIVES SINCE 1872

We took this *Plastics* problem apart...

and put
a **NEW** answer
together

Problem: grille for Carrier Room Air Conditioner shown above. Originally designed for molding in one piece, stresses and strains that were not anticipated called for a design of much greater strength. So General Industries—problem-solvers in plastics—were called in.

Answer: an assembly of 21 individual molded plastic louvers, joined with vertical rods, that retains the original beauty of design and achieves the necessary strength and rigidity. In addition, molding costs are reduced, reject losses are at a minimum and service standards are raised. ★ For more than a quarter century, many of the nation's industrial leaders have used our plastics creative and molding facilities. Our experienced field men are ready to help you with *your* plastics problems. Write to:

THE GENERAL INDUSTRIES COMPANY, DEPT. R, ELYRIA, OHIO



Peakes Rossi Flow Tests

Measuring Mold Shrinkage

High Frequency preheating

TRAINING

in step with

INDUSTRIAL

TRENDS

Plastics Institute training is predicated upon two basic principles:

- A. Thorough study of accepted practices and materials.
- B. Evaluation of current problems, new materials and new techniques.

THREE TYPICAL PHASES OF MOLDING TRAINING

Mold Shrinkage and After-Shrinkage Experienced plastics molders realize that there are still many problems to be solved in estimating shrinkage characteristics. Plastics Institute students explore such variables as pre-conditioning of molded parts, humidity, temperature, mold dimensions, etc.

Predetermination of Flow Plastics Institute students learn to evaluate the flow characteristics of molding compounds by orifice flow

tests and Peakes Rossi flow analyzers, and how to translate this data into a production cycle.

What effect humidity, pressure, high frequency preheating, storage, have on flow are typical student projects.

High Frequency Preheating High frequency preheating has resulted in a remarkable gain in plastics molding production speed and quality. Plastics Institute students study such variables as time of heating, power impact, rate of load application, and the time interval of applying load after removal from press.

In addition to molding, other phases of plastics thoroughly covered at Plastics Institute include: Materials, casting, mold design, fabricating and laminating. Industry type equipment is used in the classrooms.

Your inquiries regarding the Resident, Home Training and Study Forum Courses are welcomed.

VETERANS as well as CIVILIANS now training with Plastics Institute, upon graduation, are qualified and worthy of your consideration for employment in the various branches of the plas-

tics industry. Write to the nearest branch of Plastics Institute stating your requirements. We will endeavor to select a graduate best qualified to meet your needs.

Write Dept. MP-18

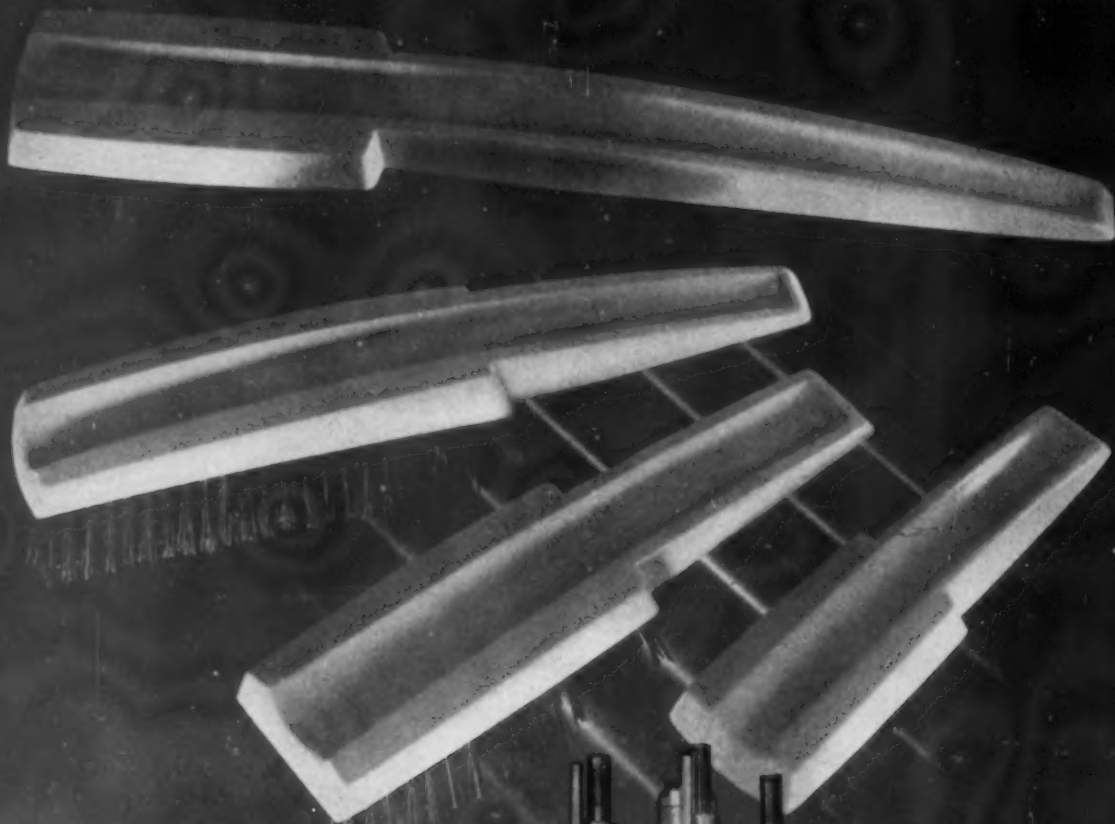
Plastics
INDUSTRIES TECHNICAL
INSTITUTE

Francis A. Gudger, President - John Delmonte, Technical Director



NEW YORK-122 EAST 42nd ST. • CHICAGO-3810 N. BROADWAY • LOS ANGELES-1601 S. WESTERN AVE.

IMPCO MACHINES on the job for Fuller Brush



More and more nationally known products are being produced on Impco machines. Because they are sticklers for quality and economical production, we are proud to add the name FULLER to our growing list.

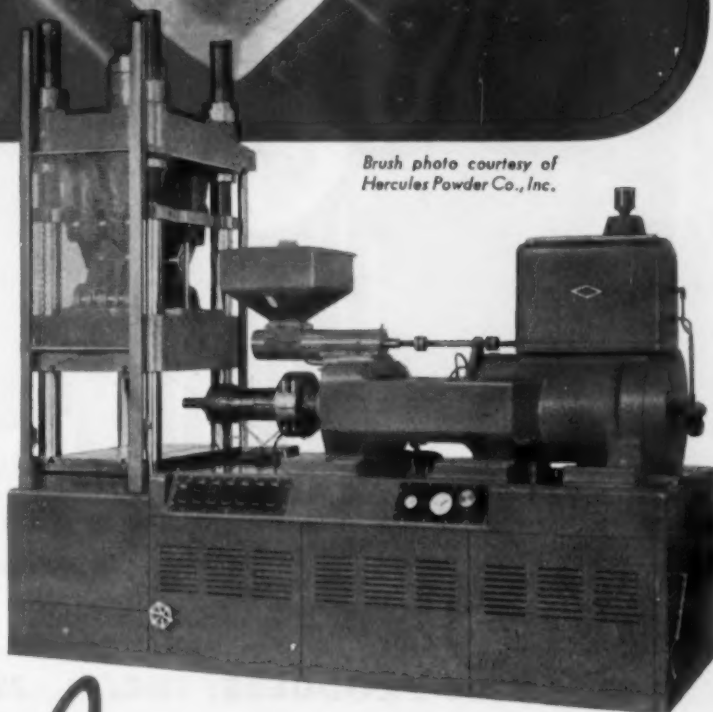
The Impco VF 822A machine is used by Fuller Brush. This is an unusually versatile machine. It may be used for (1) Straight injection molding of thermoplastic materials, (2) Injection-Compression molding of thermoplastic materials, (3) Compression molding of thermosetting materials, (4) Plunger or Transfer molding of thermosetting materials.

The Impco line also includes machines for straight injection and for plunger or transfer molding.

Our representative will gladly recommend a machine that meets your exact requirements.

MP-11

*Brush photo courtesy of
Hercules Powder Co., Inc.*



Impco

**PLASTIC MOLDING
MACHINERY DIVISION**

Improved Paper Machinery Corporation
Nashua, New Hampshire

JANUARY • 1948

29

Assembly Costs Slashed 25%

**64 SPEED NUTS on each
"Electro" Cigarette Vending
Machine Boost Production
and Reduce Assembly Costs.**



Push-on type SPEED NUTS are used over die cast studs as shown at left, to attach medallion and delivery compartment bezel, and for other fastening jobs not visible in photo. C7000 flat type SPEED NUTS are used to attach hinges to top cover, bottom frame and doors.

Mr. M. Caruso, President of C-Eight Laboratories, Newark, New Jersey, has this to say about SPEED NUTS:

"Further experiments increased the use of SPEED NUTS in assembling our "Electro" All-Electrical Cigarette Vending Machine. Since this change over, a study of our costs reveals a saving up to 25%. We feel sure that more and more Tinnerman fasteners will be used on our equipment and will set a standard of quality and perfection for the ultimate user."

We're sure we can help you produce a better product at lower cost. Write us about your assembly problem today.

TINNERMAN PRODUCTS, INC. • 2238 Fulton Road, Cleveland 13, Ohio

In Canada: Dominion Fasteners Ltd., Hamilton
In England: Simmonds Aerocessories, Ltd., Treforest

In France: Aerocessaires Simmonds, S.A., Paris

Speed

MORE THAN 4000



Nuts

PATENTED

Trade Mark Reg. U. S. Pat. Off.

SHAPES AND SIZES

F A S T E S T T H I N G I N F A S T E N I N G S



NIXON C/A* Goes Travelling in Distinctive Toilet Kit Boxes

Molded from Nixon C/A (Cellulose Acetate) Molding Powder . . . the distinctive toilet kits manufactured by Castle Novelty Company of Leominster, Mass., appeal to travelers who appreciate careful workmanship. These boxes are molded with covers that fit snugly and yet come off easily . . . in attractive colors and smooth, lustrous finishes. They keep out dust and dirt, protecting toothbrushes, toilet soaps, and other personal items from contamination.

In addition to molding powder, Nixon C/A is available in sheets, rods, tubes, and extruded shapes. Nixon Plastics are economical to use, easy to use, and practical to use. Keep them in mind and investigate their use for your next molding or fabricating job.

*Nixon Cellulose Acetate

Nixon

C/N CELLULOSE
NITRATE

C/A CELLULOSE
ACETATE

E/C ETHYL
CELLULOSE

Plastics

NIXON NITRATION WORKS • NIXON • NEW JERSEY

Representatives: New York, Chicago, Detroit, St. Louis, Leominster • Sales Agents: NORTHWEST PLASTICS INDUSTRIES, Portland, Oregon; Seattle, Washington
Canadian Distributors: CRYSTAL GLASS AND PLASTICS, LTD., Toronto, Can. • Export Distributors: OMNI PRODUCTS CORP., 460 4th Ave., N. Y. 16, N. Y.



**Molded Plastic
Parts of This
Type Are
"Duck Soup"
For Boonton**

Housing Molded by Boonton for Bendix Radio, Div. Bendix Aviation Corp., Baltimore, Md.

*Have you a Production Problem
that Molded Plastics might solve?*

Just for a moment, let your thinking wander beyond the radio housing illustrated above. Sure, we mold plastic radio cabinets, but perhaps your products call for another kind of housing—such as for a business machine, an appliance, or some other type of equipment.

If so, it will pay you to consider Boonton. We're fully equipped to mold the housings, parts, or products you need, in medium or large-sized runs from the best-suited raw plastic material, by one of the 4 major molding processes: straight compression, transfer, plunger, and injection.

Many of our customers have saved substantial sums of money by asking our engineers to talk to their engineers before their products reached the purchasing stage. They've been amazed and pleased at the ways we've come up with design and production suggestions that shaved costs all the way around. Perhaps we can do the same for you. Maybe we've learned something in our 25 years of molding plastics that can be helpful to you. We'll be glad to share this experience with you. Write or phone The Boonton Molding Company, Boonton 3, N. J., Boonton 8-2020.

Boonton

FREE to Prospective Buyers of Molded Plastics "A Ready Reference for Plastics". Get this 80-page book. Factual data on design, comparative plastic properties, molding methods.



MOLDERS OF MOST PLASTICS BY MOST METHODS

SANTICIZERS

B-16, E-15, M-17

for NON-TOXIC

tubing,
coatings,
sheets

Where lack of toxicity is essential in a plasticizer to be used for such applications as tubing for the transfer of beer, beverages, milk and liquid foods—industry is turning more and more to the use of Monsanto Santicizers B-16, E-15 and M-17.

In addition to their non-toxicity, these glycollates impart no characteristic odor or taste. This makes them further useful in their application to can and cap liners. They are also used in hospital sheetings, acrylic dentures and similar products.

QUICK FACTS

SANTICIZER B-16... Compatible with most resins; imparts good flexibility and clear, brilliant films that are tough, moisture resistant, and have good weathering qualities. Especially good with vinyl resins and nitrocellulose.

SANTICIZER E-15... An excellent plasticizer, particularly for nitrocellulose and cellulose acetate and for most resins. Light-fast and relatively non-volatile, even from the thinnest films. With both acetyl and nitrocellulose, gives clear, tough, flexible films with greatly increased resistance to moisture penetration.

SANTICIZER M-17... A solvent plasticizer for vinyls and cellulose, imparting a high degree of plasticity. Probably the best cellulose acetate plasticizer available. Insoluble in petroleum products—confers oil resistance to films in which it is used.

MORE INFORMATION... Send for literature, technical data, samples. If you wish specific information, a letter outlining your application problems will receive prompt attention.

MONSANTO CHEMICAL COMPANY, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle. In Canada: Monsanto (Canada) Limited, Montreal.

Santicizer: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS AND PLASTICS

MONSANTO CHEMICAL COMPANY
1700 South Second Street
St. Louis 4, Missouri

MPO-1

Please send me further information and technical data ☐, and samples ☐ of

Santicizer Number.....

Name.....

Firm.....

Address.....

City..... State.....

SERVING INDUSTRY... WHICH SERVES MANKIND



Tank Floats Molded

960

PER DAY

Thanks to
**Automatic
Molding**

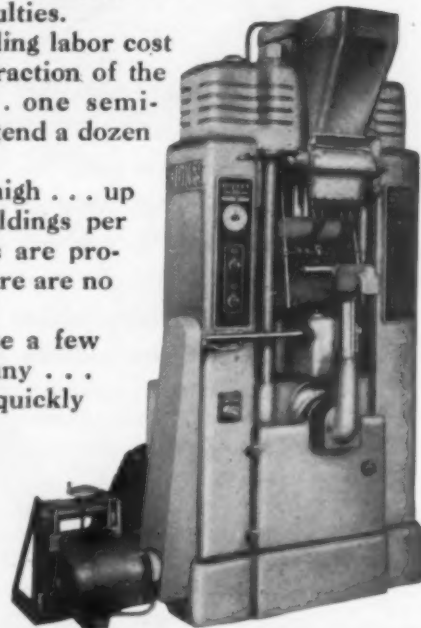
Kuhn & Jacob Molding and Tool Co., Trenton, N. J., molds these two-piece plastic tank floats on a 90-second cycle, 24 hours a day . . . and proves again that it pays to mold automatically.

These floats are molded on Stokes 50-ton Completely Automatic Presses, equipped with special unscrewing attachment. In performance, hundreds of Stokes Completely Automatic Presses demonstrate daily . . . throughout the country . . . the advantages and economies of this method of molding.



- Automatic Moldings are always of highest quality because they are produced under identical conditions of time, heat and pressure. There are no human errors to contend with . . . few rejects . . . no assembly difficulties.
- In Automatic Molding labor cost is an insignificant fraction of the total per piece . . . one semi-skilled operator can tend a dozen or more presses.
- Output per cavity is high . . . up to 10,000 or more moldings per cavity per week. Parts are produced as needed . . . there are no large inventories.
- Mold cost is low because a few cavities do the work of many . . . molds are quickly made, quickly put into production.

You also save money many other ways when you can Mold Automatically. Let us show you. Send samples or sketches and state production requirements for cost estimates and recommendations.



F. J. STOKES MACHINE COMPANY
5934 Tabor Road Philadelphia 20, Pa

Stokes 50-ton Completely Automatic Molding Press with special unscrewing attachment. Patented in U. S. and abroad.

F.J. Stokes

MOLDING EQUIPMENT



VARGUM

PHENOL

CH₂O

RESINS

VARGUM

PHENOL

RESINS

a "VARGUM RESIN" for every Job.

Varcum manufactures every type of phenolic resin that has a known industrial use. Among the forms in which our resins are available are pure phenolic, oil soluble, liquid, solid (lump, crushed and powdered), plasticized phenolic and many others.

Varcum Resins have applications wherever materials must be made to adhere; where cloth, metal or wood is to be coated; where friction is needed.

Here are but a few specific uses to which you can profitably put Varcum Phenolic Resins:

for PROTECTIVE COATINGS

Spar varnish; "quick-dry" enamels; cable cloth and bottle cap liner varnish.

for FRICTION MATERIALS

Brake blocks and industrial brake linings; automotive brake linings; bonding linings to brake shoes.

for COATING AND IMPREGNATING

Fast curing laminating compounds; laminating heavy duty bearings; impregnating wood and veneer.

for ABRASIVE PRODUCTS

Grinding wheels; abrasive discs.

for INSULATING VARNISHES

Internal curing varnishes for all wound equipment; motor coil impregnating varnishes with good naphtha tolerance.

for BINDERS

Acid and gasoline resistant cork composition gaskets; bonding of glass and mineral wool bats for heat resistance.

Inform us of your problems concerning resin selection. Chances are that our files on known applications of Varcum Resins can produce a satisfactory solution. If not, our research chemists will go to work immediately to get the answer for you.

Synthetic **VARGUM** Resins
VARGUM CHEMICAL Corporation
NIAGARA FALLS, N. Y.

VARGUM

VARGUM

CH₂O

RESINS

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PHENOL

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RESINS

WHICH MATERIAL? Magnesium or Plastics?



Call... MAGNESIUM MEETS DAS FORMABILITY

At Mazlo, we are a leader in magnesium, since 1921 we have been producing magnesium products. Our products are used in a wide variety of applications, from automotive to aerospace. We are now offering a new line of magnesium products, including a new line of magnesium alloy products. These products are designed to meet the needs of the modern designer, and they are available in a wide variety of shapes and sizes. For more information, contact us today.

MAZLO PRODUCTS



There's a Pyrex in your future

Pyrex

Pyrex Glass Company

WHAT METHOD? Spinning or Molding?



Earth-shaker TO AN EARTH SHAKER!

GRAY



It's another . . .

ERIE RESISTOR CUSTOM MOLDED JOBS

POLYSTYRENE REFRIGERATOR DRIP TRAY

ERIE RESISTOR CORP., ERIE, PA.

The magazine edited for
the men who decide . . .

- what material
- whose material
- what method
- whose equipment

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Materials & Methods

THE METALWORK INDUSTRIES ENGINEERING MAGAZINE

NATIONAL & METROIDS International Joint Competition

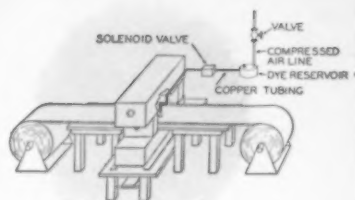
Special Collection Available—Now Ready

Now 100 Metal Tinting Data—Properties and Positions

Now Strong Materials Catalogs—After a New Method of Testing for Data Setting

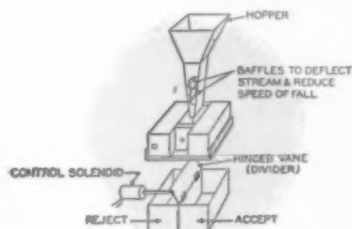
Complete Data on a Single

PAID FOR ITSELF THE FIRST DAY!



INSPECTION OF CONTINUOUS STRIP

An ideal set-up for plastic sheeting and film. When metal is detected, air pressure sprays dye on the contaminated portion. Many modifications possible to fit varying needs.



INSPECTION OF FALLING MATERIAL

A good way to inspect molding powders, fillers, and resins. When metal is detected, the hinged vane deflects the stream into the reject bin.

RCA Electronic Metal Detector scans plastic rolls, protects calender at National Automotive Fibres

"In one operation our RCA electronic metal detector saved us \$2,000," reports National Automotive Fibres, Inc., Trenton Division.

"By detecting a fairly large piece of tramp metal embedded in the plastic scrap we were processing, it prevented severe damage to our calender roll . . . saved the cost of an expensive regrinding operation."

In this plant, a preliminary visual inspection of scrap plastics eliminates obvious pieces of metal. After the plastic has gone through the milling roller, the rolls are carried on a conveyor belt through the detector's inspection aperture. If metal is present, a bell rings, the roll is removed and unwound, and the particle is eliminated.

This modern electronic equipment can spot every type of metal and alloy—magnetic or nonmagnetic, regardless of its depth in the material. Reports on units in use for more than two years attest to its reliability—even in detecting particles as small as 70 thousandths of an inch in diameter!

Here's a unique opportunity to protect your valuable tools, dies, molds, engraved rolls, and calenders . . . reduce lost production time . . . safeguard product quality . . . preserve customer good will. It will pay you to get complete information immediately. Write Dept. 55-A

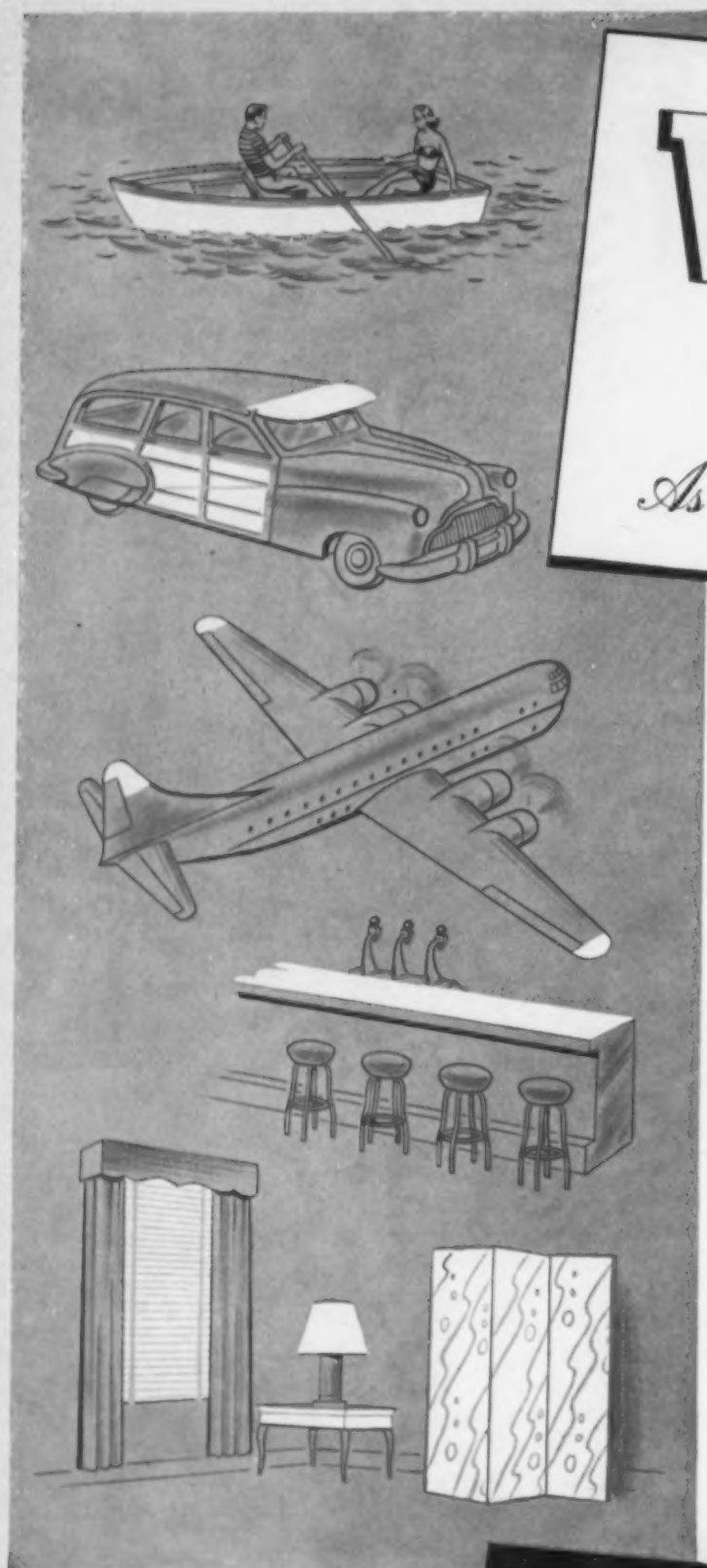


INDUSTRIAL ELECTRONICS

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal



Vibrin resins can be used as reinforcing agents in the manufacture of countless products — including such items as wall paneling, automotive bodies, wing tips for airplanes, boats, counters for soda fountains, lamps, sun visors and decorated screens.

*Reg. U. S. Pat. Off.

Vibrin^{*}

THERMOSETTING RESINS

As Reinforcing Agents

The Vibrin resins are excellent bonding agents for the lamination of glass cloth, paper, fabric and other fibrous material.

Due to their beauty, lightweight rigidity, strength and permanence, materials reinforced with Vibrin resins have many commercial uses. They can provide structural parts for airplanes, boats and automotive equipment. They can supply wall panels for the building industry. And they offer many colorful furnishings and decorations for the home—table tops, lamp shades, Venetian blinds, translucent panels, mirrors, decorated screens and other articles and parts.

Vibrins are clear, transparent liquids which can be pigmented or dyed to any desired shade. They are of low viscosity with high wetting power and are remarkably easy to handle. They cure rapidly and work in all conventional laminating processes.

Shipments of Vibrin resins are made in 50 gallon drums and 5 gallon containers from Naugatuck, Connecticut and Los Angeles, California. For full information and engineering assistance address—Naugatuck Chemical, Naugatuck, Conn.

NAUGATUCK CHEMICAL



Division of United States Rubber Company

NAUGATUCK, CONN.

BRANCHES: AKRON • BOSTON • DETROIT • LOS ANGELES • NEW YORK

Molding a Man's Taste in Cars



*Steer-o-toy. Molded for
Steer-o-toys, Inc., Chicago*

There is a special pleasure in molding playthings like this Steer-o-toy. But there is a special challenge as well. Molding a realistic toy lays it open to the keenest critic in the world—the American boy. If anybody is a hawk-eye for detail, it is the youngster who starts developing his automobile "know how" at the plaything stage.

For proof, ask any motorist or automobile dealer who has a small son or younger brother.

Our molding ability has passed this type of critical test often, for we are frequently commissioned to produce toys of varying shapes and sizes. Many of these toys are of the realistic type.

Through the use of the proper design, mold, and plastic material, they are planned for sturdiness as well as style. So, if you are out to make "pay things" of your playthings, you will be wise to investigate our injection molding and extrusion services today.



Write on your letterhead for the new Injection Molded and Extruded Plastics catalogue. Or, for detailed information about **MILLIS-PLASTICS*** pipe, tubing and fittings, write for circulars containing data and illustrations.

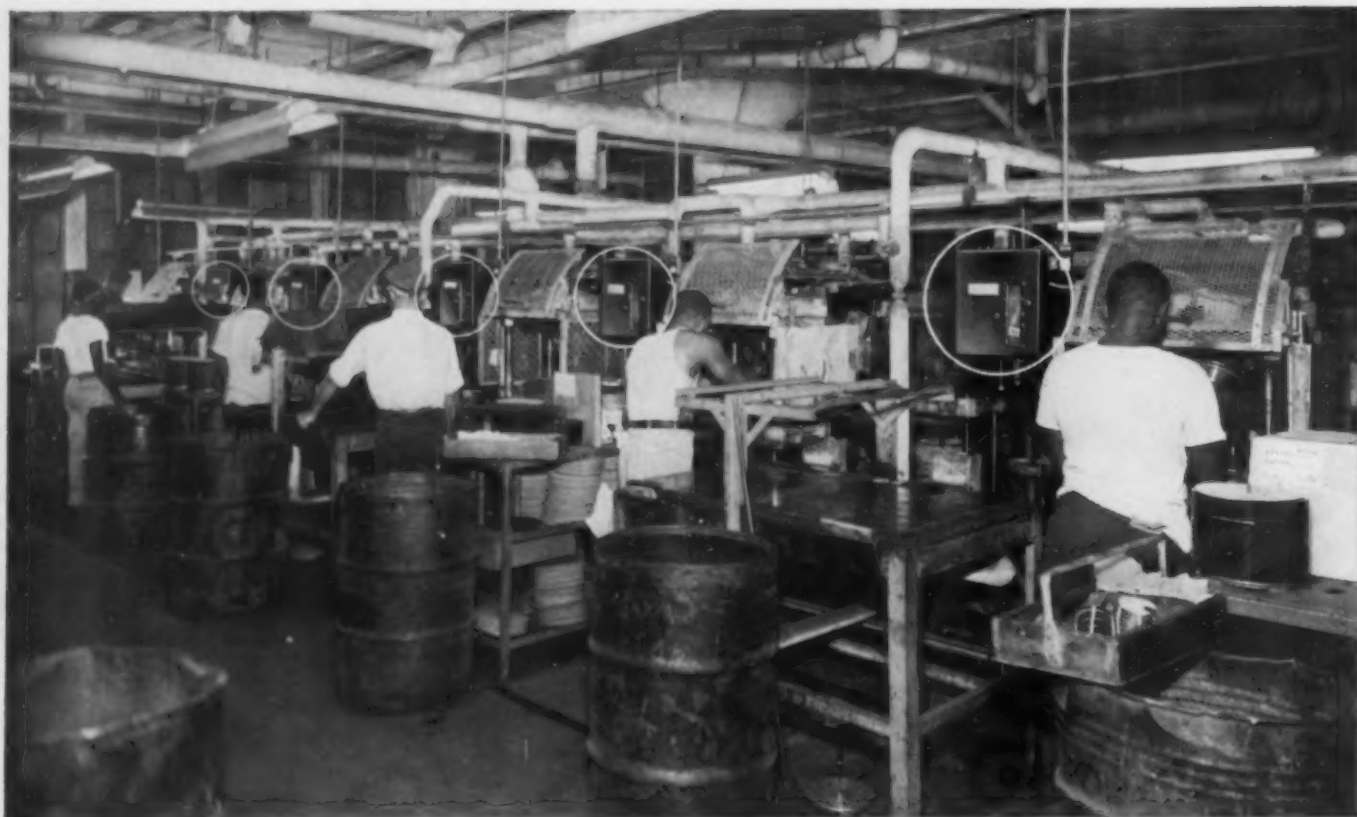
*Trademark Reg.

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastocel, Fibestos, Lucite, Plexiglas, Nylon, Polystyrene, Styron, Lustron, Loalun, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, ~~Celcon~~, ~~Acrylon~~, Saran, and other Thermoplastic Materials.

153 WEST HURON STREET • CHICAGO 10, ILLINOIS

How to make a good record



UNIFORMITY of product" is the big advantage with which Mr. Kinsman, general manager of Brunswick Radio's Chicago plant, credits their Decca record presses automatically controlled by Taylor Flex-O-Timers. They take complete charge of the molding operation.

1. Flex-O-Timer simultaneously:

- (a) closes press,
- (b) turns on steam,
- (c) positions three-way valve to connect discharge to steam trap.

2. Next the Flex-O-Timer simultaneously:

- (a) turns steam off,
- (b) turns water on,
- (c) repositions three-way valve connecting discharge to drain.

3. At end of molding period, the Flex-O-Timer:

- (a) opens the press,
- * (b) turns cooling water off,
- * (c) turns on steam for warm-up for next cycle,
- * (d) positions three-way valve to connect discharge to steam trap,
- * (e) turns steam off and timer stops.

*During steps b, c, d and e, operator can reload press, push a start button, and move on to the next press without waiting for the Flex-O-Timer to complete previous cycle. Timer automatically restarts itself.

This is another way accurate Taylor Instrumentation can help you make a good record for high quality and low operating costs. Ask your Taylor Field Engineer. Or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

Taylor Instruments

— MEAN —

ACCURACY FIRST

IN HOME AND INDUSTRY

**AVAILABLE
NOW!**

THE LAST WORD IN MOLDING

...THE NEW

DE MATTIA MULTI- PURPOSE PRESS

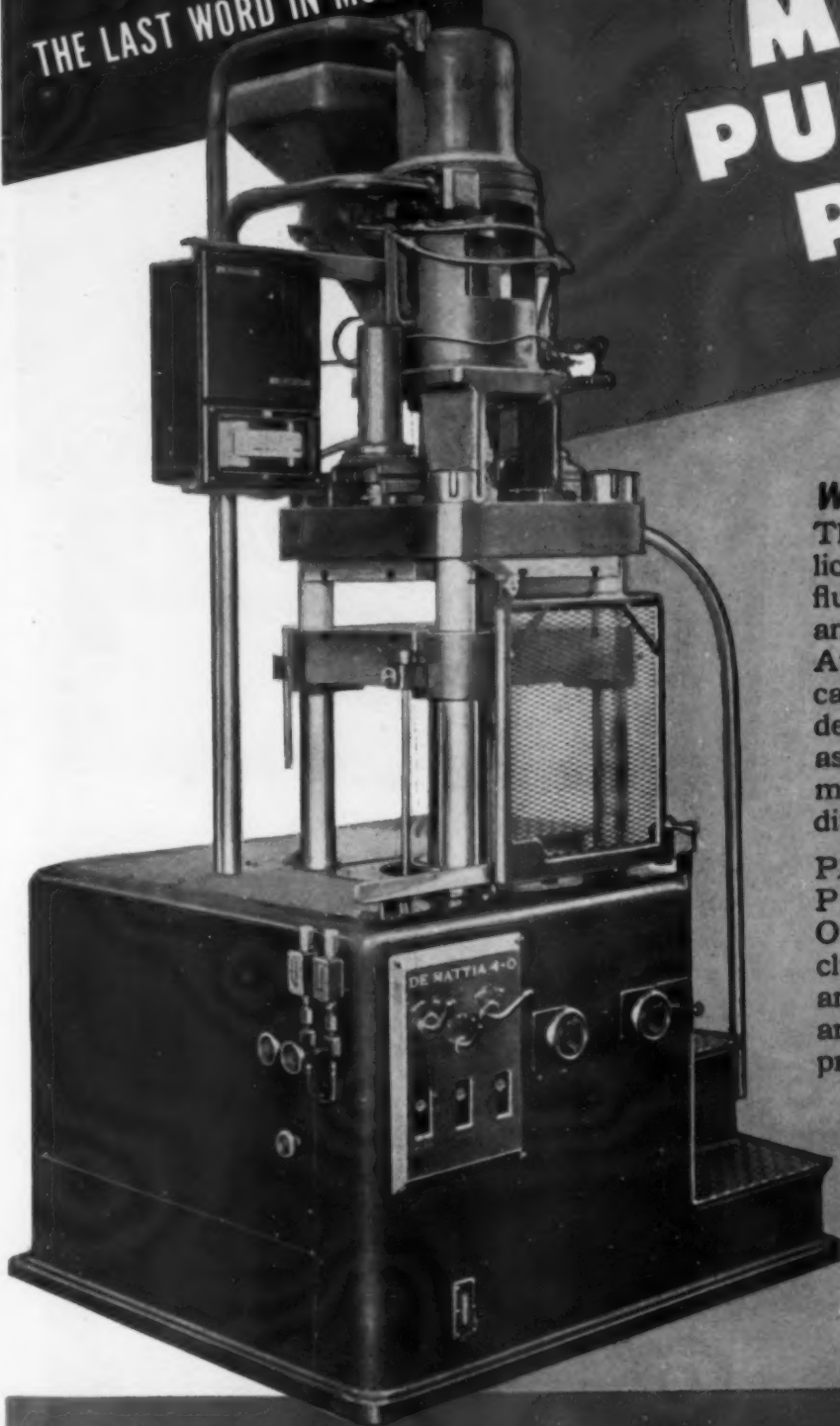


WELL WORTH INVESTIGATING!

This new De Mattia all Hydraulic Vertical press features smooth fluid power both for injection and mold clamping operations. Available in both 4 oz. and 12 oz. capacities, this unit has been so designed that it can also be used as a compression and transfer molding press with a few additions at small extra cost.

PACING PROGRESS IN PLASTICS SINCE 1909—

Other De Mattia machines include horizontal models in 6, 12 and 24 oz. capacities. All types and sizes feature the latest improvements and are basically designed for lasting dependability. For complete specifications, and information on molding presses, scrap grinders and mold making facilities, please write on company letterhead.

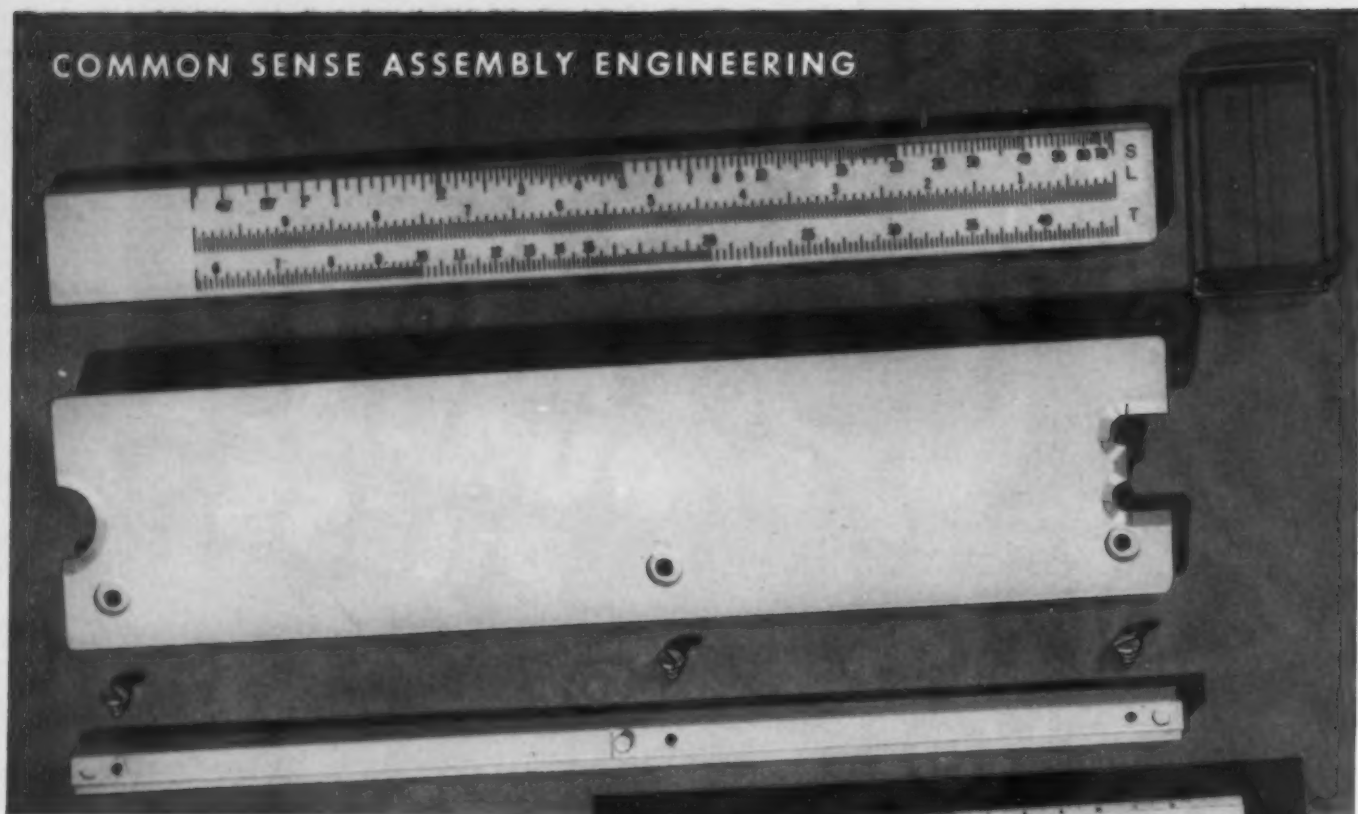


DE MATTIA MACHINE and TOOL CO.

CLIFTON, NEW JERSEY • N. Y. Sales Office: 50 Church St. • Cable Address: Bromoch, N. Y.

DE MATTIA
MACHINE and TOOL CO.

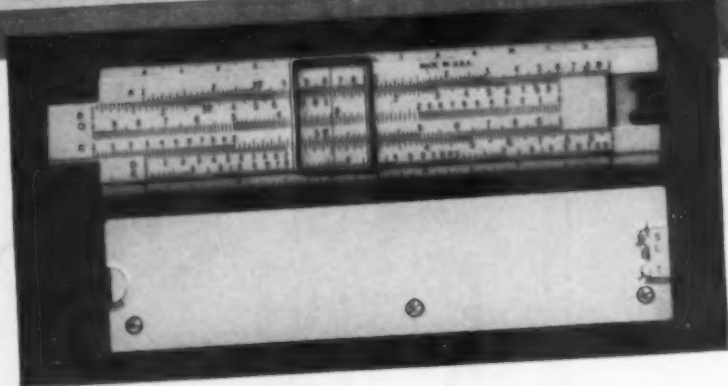
COMMON SENSE ASSEMBLY ENGINEERING



Slide-Rule Maker Skips Tapping...

computes a

75% Saving



▲ Three P-K Type "Z" Screws fasten the lower scale to the rule and also serve to regulate tension of movement of the slide. Screws can be tightened or loosened as required without impairing security or stripping threads.

IN these slide rules produced by Pereles Bros., Inc., of Milwaukee, first ever made of molded plastic, a miss of more than .0005 in dimensions between lines might as well be a mile. Fastenings required to attach the lower scale and regulate tension on the slide had to permit maintenance of comparable precision.

P-K Type "Z" Self-tapping Screws were chosen because they meet precision requirements fully, and lower assembly costs 75% over blind-tapping

or mold-complicating inserts for machine screws.

Can you secure for your product assembly cost-cutting advantages like these? In 7 out of 10 jobs studied, the answer is "yes". By eliminating needless tapping, or inserts, you can assemble your product faster, make it simpler, stronger. Ask a P-K Assembly Engineer to look over your assembly and see if it is one of the lucky seven. Or, mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Sold Only Through Accredited Distributors



TYPE
"A"



TYPE
"Z"



HEX HEAD
TYPE "Z"

P-K

REG. U.S.
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TYPE
"P"



TYPE
"U"



TYPE
"F-Z"



TYPE "Z"
PHILLIPS

PARKER-KALON

SELF-TAPPING SCREWS

A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY

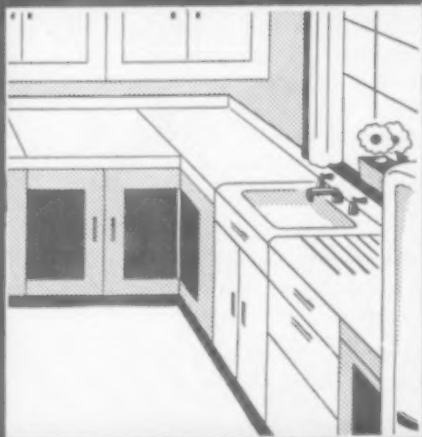
It's Right **FOR WHITE**

Now you can get PLYON*, the all-white, pure-white laminate which will blend favorably with the gleaming, pure white enamel of stoves, refrigerators and other kitchen equipment.

It has the physical characteristics of the ideal surfacing material. It's proof against soaps, greases, most acids and alkalis. It's scratch resistant. It doesn't chip. Hot pots and pans can't char a surface that's unaffected by temperatures as high as 275° F.

PLYON is produced in the two thicknesses of .025 and .050; in widths up to 42 inches and standard lengths up to 12 feet in .050 gauge (.025 gauge shipped in 100 foot rolls.)

Write for prices and further information on snow white PLYON now.



PLYON FOR KITCHENS

Lustrous snowy-white PLYON is just right for kitchen and laundry work tops, cabinets, wall surfaces. It cleans in a jiffy, resists most acids and solvents, stays smooth and shining even after years of hard use. It's also available in pastel shades, solid colors and a variety of smart decorative patterns.

* Reg. U.S. Pat. Off.

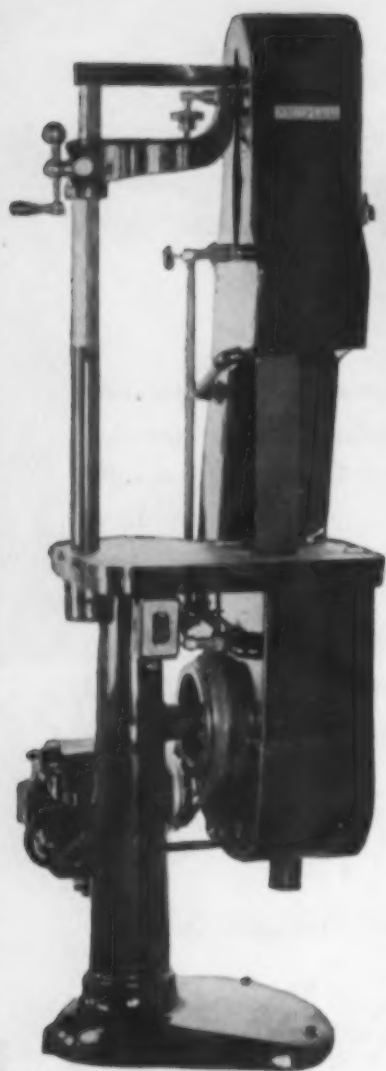
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Sole foreign distributors:

Omni Products Corporation, 460 Fourth Avenue, New York 16, N. Y.

PREVENT FLOW... Discoloration... Distortion in Your PLASTIC OPERATIONS

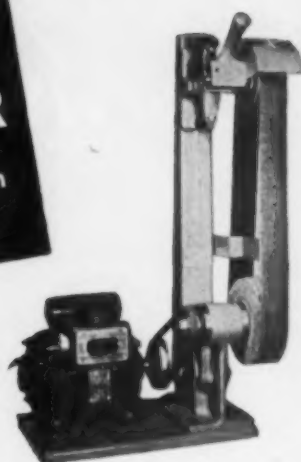


PORTER-CABLE
Abrasive **BELT SURFACER**
Speeds Clean-Up... Increases Production
Improves Finish

For thermoplastics and some thermosetting plastics, the Porter-Cable Surfacing Methods prevent main worries: flow, discoloration and distortion.

In **Wet-Belt Surfacing**, the coolant is sprayed on before and after cutting, and thus keeps the belt free and clean at all times. Furthermore, the grindings do not weld and load the belt because this method eliminates heat.

The **Flexible Belt** follows the contour of a piece. For long-run repeat operations, a padded platen fits the flexible belt to the exact contour of the job. Even spherical pieces can be smoothly finished.



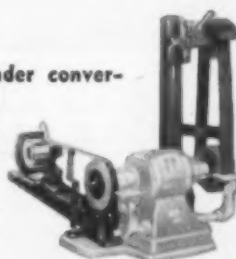
MODEL CN-2 Uses dry belt. Grinds on contact wheel, platen or free belt. Arbor for V-type driving pulley permits use of this unit independent of a bench grinder. Adjustable for vertical or horizontal use within 90° arc. Has Resilient Contact Wheel—Platen—Abrasive Belt—Idler—Furnished with or without motor.

MODEL B-6W Cuts Cost and Improves Finish. Especially designed for curved or irregular work, this model will handle most jobs free-hand or with simple fixtures. You can make a single pass in a fraction of usual surfacing time.

MODEL WG-4 Does Most Operations Free-Hand! Porter-Cable's new all-around Wet-Belt Surfer... Ideal for light operations. Grinds flat on the platen—line contact grinding on the resilient contact roll. Has self-contained coolant system and recirculating tank. Drawer traps all grindings and waste.



MODEL N-2 A belt grinder conversion attachment for bench grinders that increases output 200% over ordinary Abrasive Wheel. Quickly adjusted to either vertical or horizontal position.



Write today for FREE copy of "Production Man Speaks." It describes a process as new — as vital — as the plastics industry itself.

Send also for film: "Machine of the Age." Loaned FREE for factory staff meetings.

Every Model Saves You Money!

PORTER-CABLE
MACHINE COMPANY

1606-1 NORTH SALINA ST., SYRACUSE, N. Y.

A CAST PHENOLIC RESIN OF EXCEPTIONAL QUALITIES

MARBLETTE

Outstanding among plastics, Marblette has a jewel-like depth and a complete color range which duplicates the appearance of precious stones, tortoise shell and ivory.

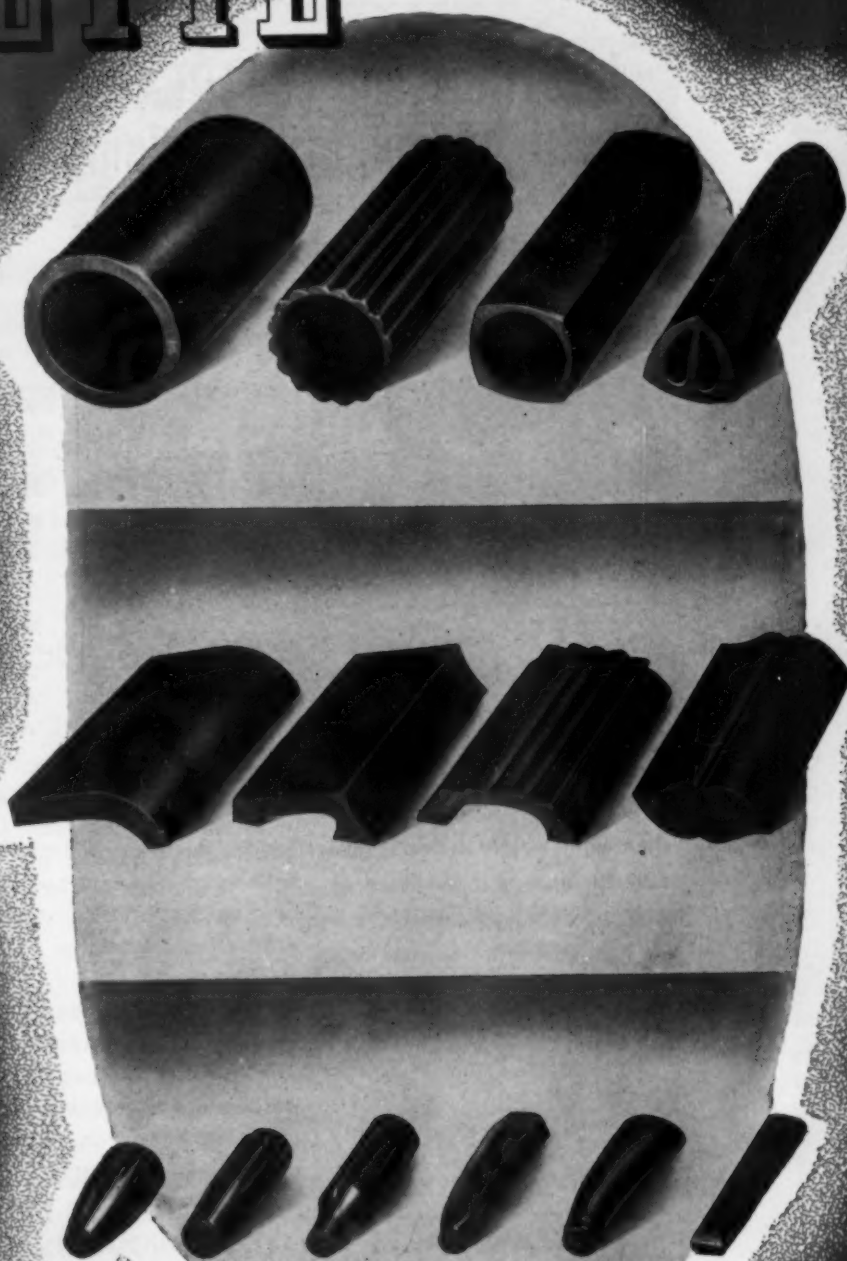
Its almost infinite variety of colors is available in transparent, translucent, opaque, or in mottled effects. Marblette also comes in a water clear form known as "Crystle" in a wide choice of colors.

Marblette's machining characteristics, resistance to oils and acids, non-inflammability and exciting beauty make it ideal for countless manufacturing needs.

MARBLETTE will help plan your world of tomorrow. The Marblette staff of engineers offers its services to help with your manufacturing problems. Write to us outlining your needs.

THE MARBLETTE CORPORATION

Manufacturers of Phenolic Resins since 1929



SPECIAL CASTINGS

Marblette is supplied in sheets, rods, tubes, and special castings such as cutlery handles, kitchen utensil handles, pipe stems, cigarette holders, clock cases, automotive trimmings, jewelry items, buckles, etc. Special shapes made to customer's specifications can be supplied provided draft is all one way.

37-21 THIRTIETH ST., LONG ISLAND CITY 1, N. Y.

FOR YOUR INFOR **M** ATION

LUSTRON* and LUSTREX make light of weighty problems



When light weight is really important — as it is in the case of this fluorescent light shield—your No. 1 materials are Lustron and Lustrex. Monsanto polystyrenes are lightest in weight of all rigid plastics . . . one-tenth the weight of usual alternatives and much lighter than so-called "light" metals.

Besides this important quality of light weight, Lustron and Lustrex have much to offer in outstanding production advantages . . . extra sales appealing qualities. Check the outstanding properties listed here against your requirements. You can use the coupon on opposite page to get complete technical data on Lustron, Lustrex and other Monsanto plastics.

9 ADVANTAGES FOR YOUR PRODUCTS

1	Light weight	6	Rainbow range of colors, clear or opaque
2	High heat-resistance (Lustrex)	7	Excellent electrical properties
3	High dimensional stability	8	Excellent resistance to moisture, acids, alkalis
4	Adaptability to high speed mass-production methods	9	Freedom from taste and odor
5	Low cost		

How large a piece can you mold in plastic?



The answer changes and old limitations are removed as material makers, molders and equipment makers improve their techniques. For example . . . in weight, the term by which the plastics industry figures size . . . 25 ounces was the limit a few years ago. But today there's a Resinox* speaker housing that weighs 10 lbs. 14 ounces. There are big 9 inch cam wheels of Resinox for textile machinery. Also two-piece radio combination Resinox housings of over 13 lbs.

So don't rule out plastics on any size job because of information you had a few years ago. If you'd like a specific answer to your size problem . . . or any question about plastics . . . write directly to Monsanto or use the coupon.

Answers to your plastics problems

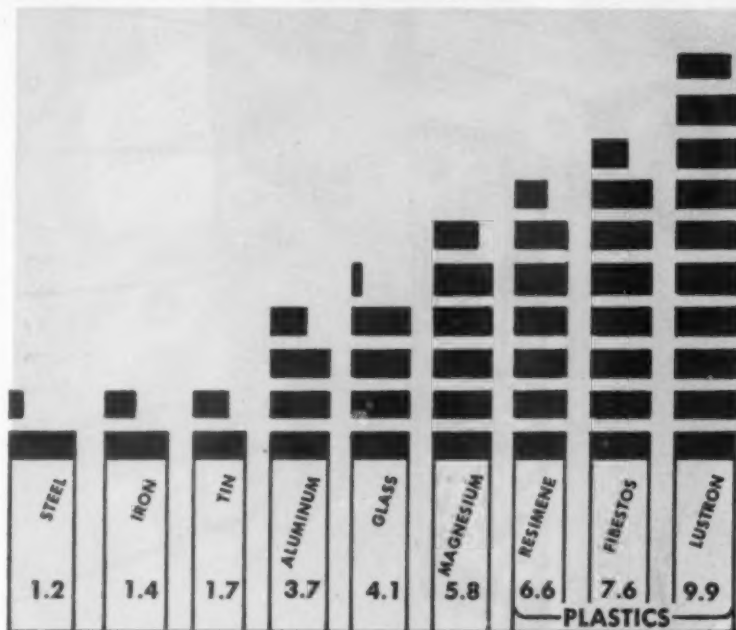


Every week a group of ten men, whose experience brackets the diversified plastics industry, meets at Monsanto's Springfield offices to answer questions asked by manufacturers and molders. "What's the right plastic for my product?" "Will my idea work?" "How much will it cost?" Thousands of questions like these have been handled with complete written reports by Monsanto's Plastics Technical Council. You are invited to take advantage of this practical advice . . . use the coupon to send for special form on which to submit your problem.

News about Plastics from Monsanto Chemical Company

January...1948

How to make the most out of a pound...



True, there's always just 16 ounces in a pound. But you get more material per pound . . . more individual items per pound . . . out of low specific gravity Monsanto plastics.

The graph here shows a typical case . . . proves you can get more out of a pound of Monsanto plastics. Chances are, Monsanto

has a practical plastics answer for your weight problem, too. For complete information and technical data on the versatile family of Monsanto plastics, use the coupon on this page or write direct to: MONSANTO CHEMICAL COMPANY, Plastics Div., Springfield 2, Mass. In Canada, Monsanto (Canada) Limited, Montreal. *Reg. U. S. Pat. Off.

Light weights are rugged, too!

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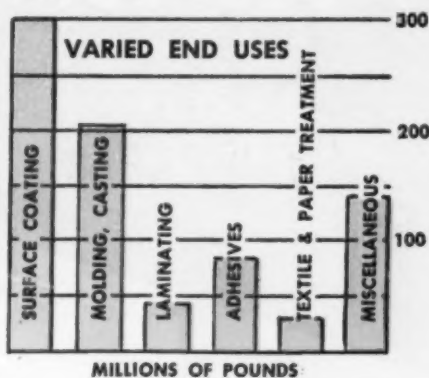
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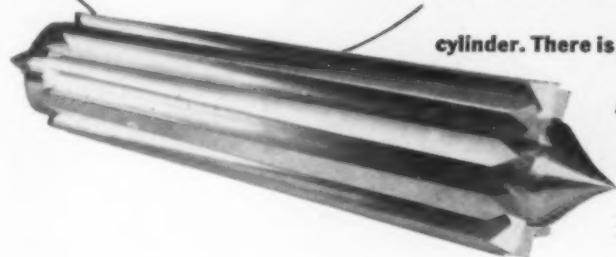
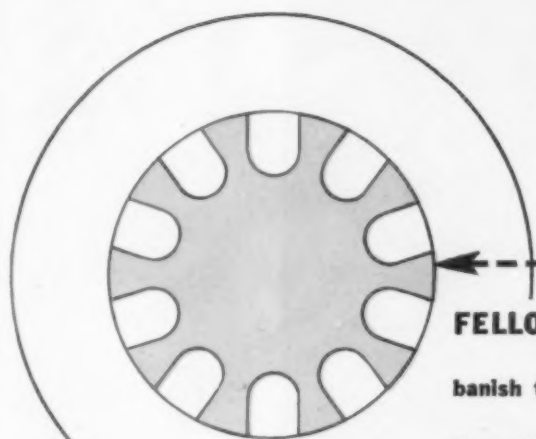
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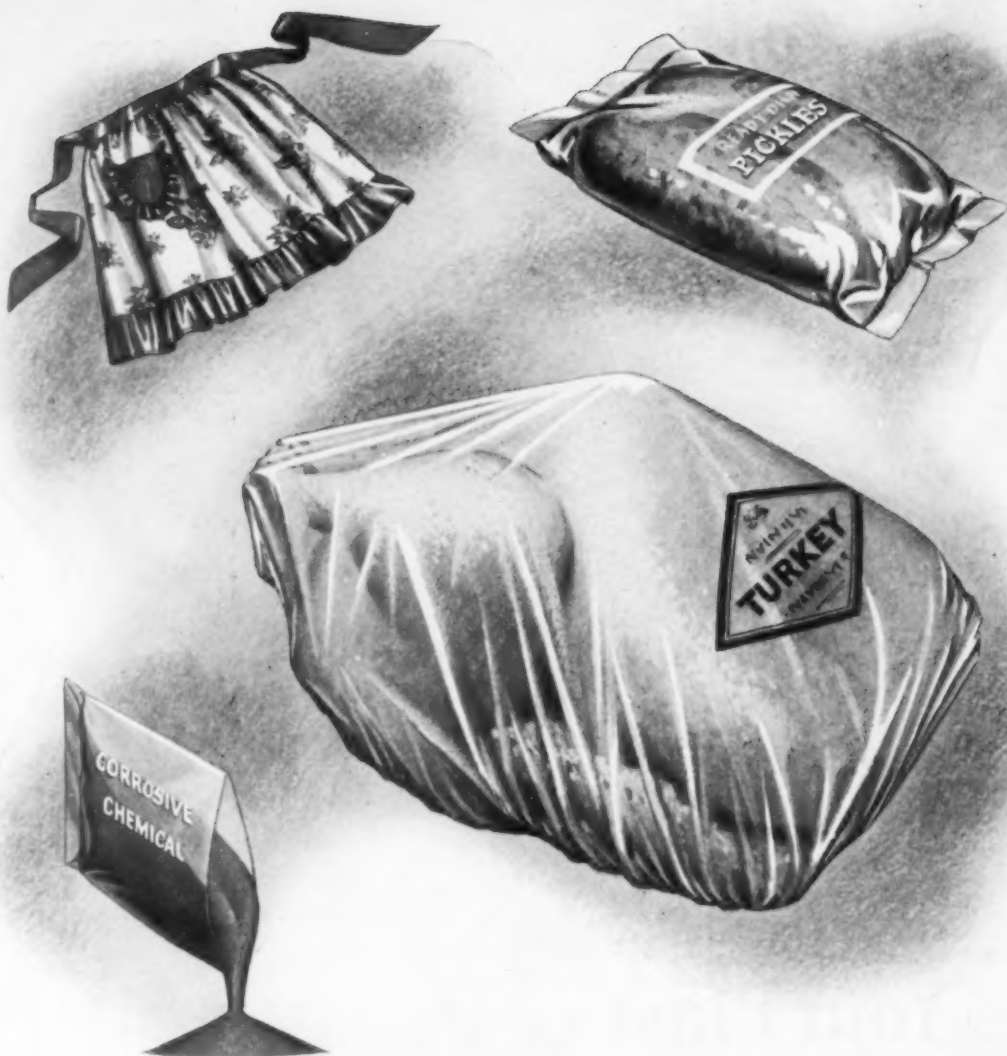
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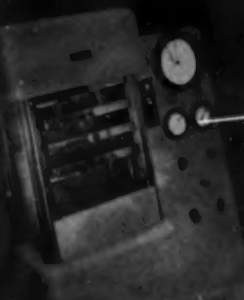
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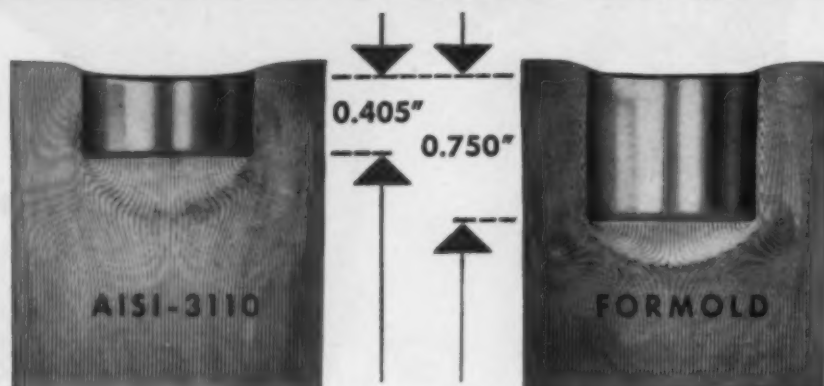
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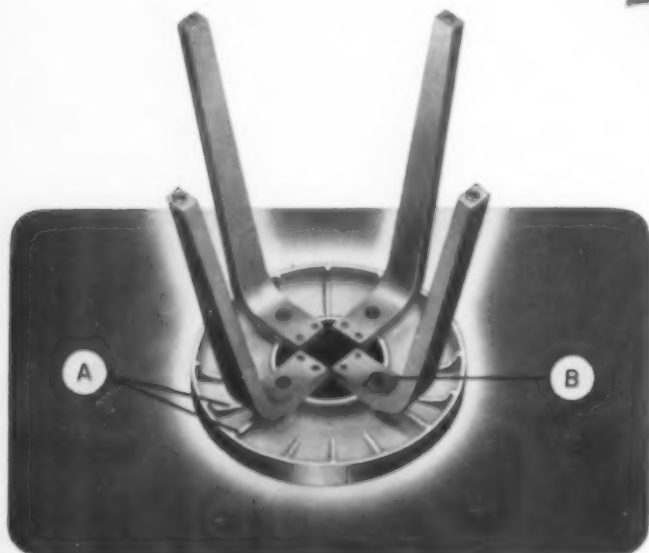
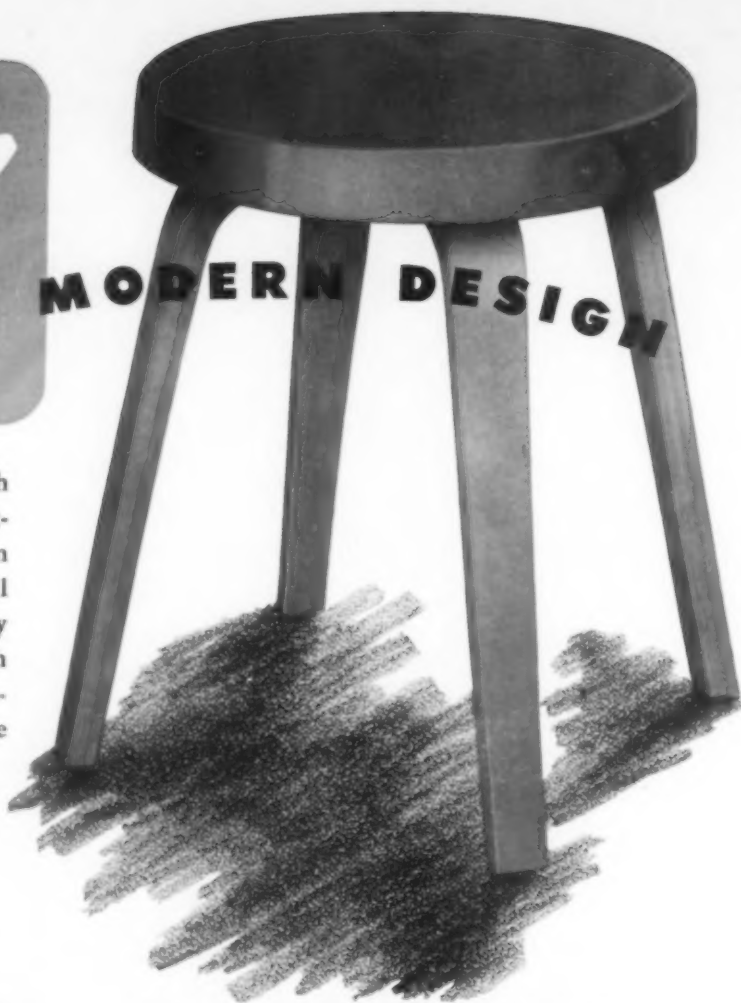
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MANY THINGS ARE BETTER BECAUSE OF PLASTICS

Looking toward 1948

FLOOR and ceiling both got bumped by the plastics industry in 1947. Flying along early in the year like the 20th Century Limited, the industry jumped the track in early Spring and scraped the road bed for a short distance; but once it got back on the rails, it seemed bent on breaking all records, and present statistics indicate that the industry will use about 13% more resins and celluloseics in 1947 than in 1946, or over 830,000,000 pounds. This figure does not include resins used for protective coatings.

The early Summer slump was more alarming than it was harmful. Business had been so "wonderful" during the winter that the shock of a rapidly receding market starting about March created a minor panic in the minds of many plastics manufacturers who had built up large inventories of raw materials and suddenly found that there was a dearth of orders. The decline in orders was no phenomenon peculiar to the plastics industry alone. Standard & Poor's Industry Surveys point out that the position of most merchandisers became uncomfortable late in 1946 as a result of large inventories, substantial outstanding orders, and increasing consumer price resistance. Because of 1) a flattening out of sales gains, 2) talk of economic recession, 3) disappearance of shortages, 4) fear of price

The plastics industry, after a tough year, optimistically faces the future

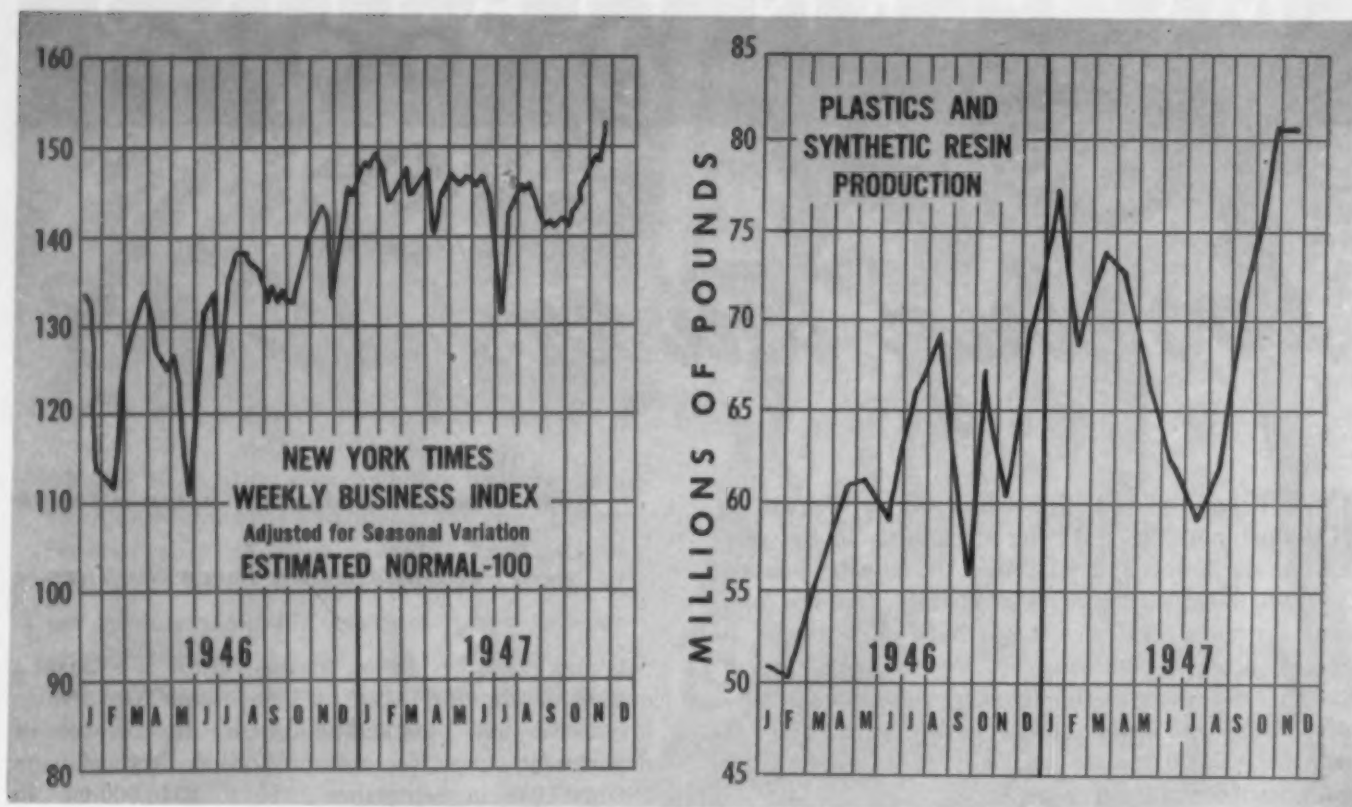
cuts and inventory losses, and 5) return of a buyer's market, steps were taken by large retailers to reduce inventories and outstanding orders. In the case of department stores, for example, orders declined from \$960,000,000 in September 1946 to \$348,000,000 in May 1947. Heavy markdowns were accordingly made to move merchandise and bring about a better balanced inventory position.

On the bargain counter

Seeing this trend, many members of the plastics industry became scared. While plastics merchandise was on the bargain counter at knockdown prices, acetate production fell from a high of 8,000,000 lb. consumption in January to less than 3,000,000 lb. in July; polystyrene fell from 7,500,000 lb. to about 5,700,000 lb.; vinyls fell from 17,000,000 to 12,000,000. Plastic combs were and are now on sale at three for a dime; a \$20 injection molded model boat was offered at around \$4; hand bags dropped from \$16 to \$4 on

FORECAST AND REVIEW

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Although plastics entered the industrial field rather late compared to other industries, it can be seen from a comparison of these charts that plastics production follows general business trends rather closely

the sales counter; shower curtains at cut prices made mountainous piles on store counters. Bad as this all seemed, it was only a part of the general business situation. Other industries, too, had the willies as retail outlets cleaned out inventories. The decline in sales of plastics products helped to point out some weak spots in merchandising, one of the most glaring of which is a tendency to concentrate on one product. Combs, for instance, had been one of the first thermoplastic items molded. During the war, they were classified as essential, and it seemed as though almost every molder got into the business. Hundreds of thousands of pounds of acetate were actually allocated to combs. There must have been enough made to last for years. Today they are still made in quantity but are hard to move unless they have a special design. If all but one or two comb molds were destroyed, everyone concerned would probably be delighted. Clothespins are another example. They are a good application, but within limits. One man tried to concentrate on them and expanded from one machine to nine. Today he has learned that diversification of manufactured products is safer and more profitable.

Shower curtains are another example of the rush to find a good thing. When it was discovered that vinyl compounds were superior for this purpose, it seemed that everybody in the business, and many outside the field, wanted to get in. Even if they had all made good curtains the market wasn't there for such great quantities; and when irresponsible parties dumped poorly

compounded and processed material on the buyers, the damage to the entire vinyl industry was not slight.

The scare from the Summer slump not only pointed out these unbalanced situations, but it brought home the fact that the day of order taking is over; the job today is to *sell*. It is amazing and encouraging to see how the industry has taken this lesson to heart. Sales managers and company managements are conducting an intensive search for new products; engineers are styling and modeling their designs to take advantage of plastics' special properties, such as color, light weight, moisture resistance, etc.; and the public is gradually being educated to look upon plastics as a material that is highly desirable but which must be handled with certain precautions. To cite one example, the housewife has at last begun to learn that thermoplastics cannot be exposed to extreme heat, any more than can china or certain fabrics.

Fortunately, the slump ended suddenly in July, and consumption has been moving ahead rapidly ever since. It seems that the howl was far worse than the bite in so far as actual fatalities were concerned. There were fatalities among those who operated with a telephone, desk, and chair as their sole equipment, of a few molders who had overexpanded, and great numbers of fabricators who had set up shop to make picture frames or similar gadgets with no idea of how to get other business. But only a few well-established firms closed their doors, and even then the reason was frequently a personal one rather than (*Please turn to page 146*)

Raw materials

Cellulose acetate and kindred materials

As shown by an accompanying chart, cellulose acetate and cellulose acetate butyrate molding materials suffered a decline in 1947 but what the figure for the year does not show is that they came back strong in the last quarter. The reasons for the drop are generally felt to lie in the fact that acetate costs are nearly 20¢ a lb. or more higher than clear polystyrene and in the general slump which hit all thermoplastics last summer. Acetate producers admit that a great portion of markets where cellulosic properties are less important than price has been switched to polystyrene, but they insist that some of the applications will be regained through consumer demands.

Production of all cellulose acetate and cellulose acetate butyrate slipped from a high of over 9,500,000 lb. in January 1947 to a low of 4,000,000 lb. in July. Continuous sheeting of "under and over 0.003 gage" held quite well, running from 1,100,000 to 1,400,000 lb. per month, with an exceptional month in October for the heavier gage continuous sheeting when production reached over 1,000,000 pounds. The principal drop was in molding material which declined from nearly 8,000,000 lb. in January to 3,000,000 in July, but was back up to around 5,100,000 lb. in October. The total for 1947 was off some 20,000,000 lb. from 1946.

Producers are by no means expecting a further decline in 1948. The last quarter upsurge was heartening, and they expect it to continue into 1948. One producer estimates that by March, total production of acetate and butyrate molding materials will be back up to the 8,000,000 lb. record production set in January 1947. Observers expect total consumption of molding powder, sheeting, etc., to go well over 100,000,000 lb. in 1948—possibly to 120,000,000 lb. if exports of nearly 1,000,000 lb. a month continue. During the year Du Pont announced discontinuance of molding material production, but its production of several hundred thousand pounds a month was not of major importance in total production.

Price is a vital factor in the future of this material. Major companies put through a price reduction in October but are hesitant to predict another. Cotton linters, a necessary raw material for some grades of flake, dropped from 12¹/₂¢ in January to around 6¹/₂¢ in November, but this factor was supposedly counteracted by the previously announced price reduction. But regardless of the reason why linters dropped in price in

1947, cellulose producers cannot be sure what this material is going to cost in 1948.

Other raw materials needed for flake, such as wood pulp, acetic acid, and other chemicals, as well as all other costs, went up in 1947 and may go higher in 1948. But producers are hopeful of attacking the cost situation from other angles in 1948.

Thus, one company has found that it can furnish material of guaranteed quality in a large variety of restricted dark colors that can be sold for as low as 33¢ a pound. It reports that molders have not yet fully realized the possibilities of this development but are expecting large movements of this material when it becomes better known and has proved its worth.

Still another possibility is development of processing machines which molders can install in their own plants. With such equipment available, they can buy cellulose acetate flake at around 35¢, process it themselves, and obtain molding powder at a reasonable cost. One of these units, quoted at about \$5000, can reportedly make 3000 lb. of molding powder in an hour although it produces a lighter, more fluffy material about 87% of standard. (Please turn to next page)

Plastics industry wage rates are taken from wage surveys made by S.P.I. Cost of living and wages in all manufacturing industries are taken from United States government reports

REDRAWN FROM A CHART COPYRIGHTED BY S.P.I.

PLASTICS INDUSTRY WAGE RATES COMPARED WITH LIVING COSTS AND ALL MANUFACTURING INDUSTRIES

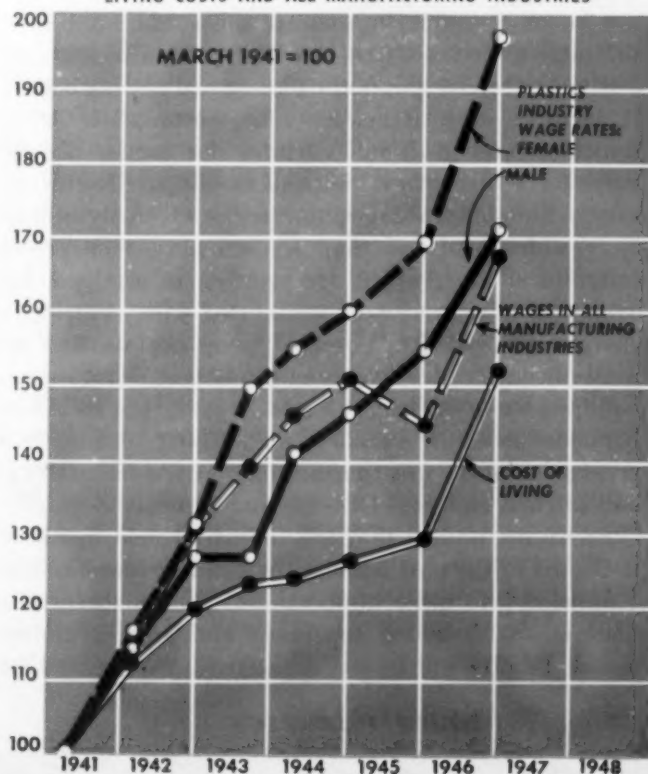


Table I—End Use Forecast for Cellulose Ester Plastics

	1948, %	1947, %	1946, %
Automotive	17	17	15
Continuous extrusion	20	15	15
Industrial	35	31	30
Agricultural	7	5	3
Household	5	7	15
Toys and novelties	3	5	12
Miscellaneous	13	20	10
	100	100	100

Producers are also devoting far more energy to studying, examining, and promoting their material than ever before. One company shifted parts of its sales staff to the job of talking to designers, retail personnel, and large industrial users of end products in order to get their ideas and educate them on cellulosic materials. This company also promoted a large direct mail selling campaign showing samples and telling why they were made of acetate. The literature used further commented on how different combinations could be made to meet certain specifications or could be literally tailor-made to do a given job.

The cost angle has forced the channeling of the cellulose into a different pattern for end products. It seems agreed that although many of the products which went to polystyrene have or will return to acetate because of certain basic properties which were inherent in acetate and butyrate, there has been a trend towards functional applications requiring the stability, strength, toughness, and ease in molding qualities of cellulose ester plastics. Improved formulations will further strengthen this trend. Development of the propionates is another step in that direction.

According to one producer, the breakdown for end uses of cellulose ester plastics in 1948, in comparison with 1947 and 1946, is about like that shown in Table I. Note the downtrend in toys, novelties, and household applications, also that producers expect their automotive business to hold up despite the hubbub raised in automobile circles to the contrary. Continuous extrusion is a bright spot in the picture and getting better. It includes such items as refrigerator shelf trim, stanchion and grab rail covering for buses, divider strips for terrazzo trim, and wall moldings. Industrial uses include butyrate telephone bases which are now in more widespread use than some realize. The chief agricultural uses, which are growing in size, are for irrigation tubes and equipment used with electrically charged fences. In household uses, acetate has recently been adopted by one of the largest brush manufacturers for brush backs of many types; but its use in cosmetic containers, combs, etc., which took such a great share of the war-time production, has fallen away, and kitchen gadgets of acetate are in lesser demand.

Producers believe that the industrial field has been neglected in the past because the molding material was channeled into other applications. The higher grade materials with added toughness and greater dimensional stability will be used in increasing quantities for

housings for vacuum cleaners, cake mixers, and vibrators; for display stands; and for electrical fixtures such as an electric blanket switch, fluorescent light fixtures, and conduits. There have been disappointments in some of these applications, but developers believe that they are on the right track and will soon have the right combination in improved compounds.

Interesting new markets.—In the search for new markets where his cellulose acetate can be used, one producer lists four unusual developments for 1947. They are:

1. Acetate shoe heel coverings. This has been one of the largest outlets for cellulose nitrate for years and if permanently switched to acetate will use considerable poundage.

2. Heat sealing. Heretofore, it has been difficult to heat seal acetate for packaging purposes. Heat sealing on a recently built machine will extend the market by thousands of pounds. Another method to increase use of acetate for packaging was the introduction of solvent glue pots which could be attached to ordinary heat sealing machines to enable them to handle acetate sheeting.

3. Wall paper laminating. A compound that can be applied to make wall paper stain, grease, and waterproof was introduced in 1947. There are several types of plastics now being used for this purpose, but the acetate folks think they have proved their products' applicability and economical usefulness.

4. Thermoplastic laminates. Just beginning to come along after several years of experimentation, luggage cases now on the market have been satisfactorily tested to stand up under abuse and weathering. Other products on the way are sample cases, typewriter and Thermos bottle carriers, gun cases, and lamp shades. Automobile manufacturers are testing these laminates for interior lining, arm rests, sun visors, head liner, kick plates, and inside door panels.

Another sidelight on new markets is found in the remark of a divisional representative for one company who said he would increase his sales of acetate by 20% in 1948 in fields other than molded plastics—namely, lacquers, photographic materials, and synthetic textiles.

Packaging.—Nearly all plastics are concerned in packaging, but the immediate future is of particular significance to acetate and polyethylene. Current research and investigation are intensive, but published statistics are scarce as hens' teeth. Of one thing, the researchers are certain—cost is highly important. Containers for goods must not absorb too much of the total cost. One tenth of a cent per unit is often a highly important factor when added to packaging costs, and plastics must compete in this field with low-cost materials such as paper.

We emphasize this point because the plastics industry members are perpetually pointing to the packaging field as their great potential outlet, but researchers making studies of the field are constantly finding all these wonderful potentialities only to discover that cost is frequently too high. There are a few

firms who have been working on packaging materials for years who have learned their lesson, but we are speaking here largely to those who foresee this packaging outlet for plastics but haven't given the cost factor serious enough consideration.

The only published figures available on plastics in packaging cover the amount of cellulose acetate and cellulose acetate butyrate sheeting produced. Even then there is no breakdown on the amount actually used for packaging, since good-sized quantities are used for calendars, greeting and playing cards, lamp shades, optical frames, lenses, hand bag frames, books and brochures, and other miscellany. Production of acetate sheets, rods, and tubes has risen from about 10,000,000 lb. in 1939 to around 20,000,000 lb. in both 1946 and 1947. The fact that the latter year did not show an expected rise of some 5,000,000 lb. again emphasizes the difficulty of getting into the packaging field where it was expected the gain would take place.

There is, however, basis for believing that a large portion of the 15,000,000 lb. of continuous sheeting, both "under and over 0.003 gage," is used for packaging, the thin gage largely for food and the thicker gage for boxes. October production of more than 1,000,000 lb. of "over 0.003 gage" was about 200,000 lb. more than in October 1946 (high month for that year also). Although much of this increase was doubtless due to the demand for Christmas boxes, it may also have been influenced by development of a new automatic box-making machine of which it is said that less than 10 such machines could take the entire amount of "over 0.003 gage" sheeting now available. This machine, plus the newly acquired ability to heat seal acetate, should certainly increase the use of transparent acetate boxes of all kinds.

The most intriguing field today, however, is in food packaging—a field that could use enough "under 0.003 gage" film to make present consumption look puny. There seems to be no doubt in the minds of merchandisers that more fruits and vegetables will soon be arriving at the grocers in neatly done up packages—that fruits and vegetables are due to follow the cracker from the open bushel basket to the sanitary and handy container.

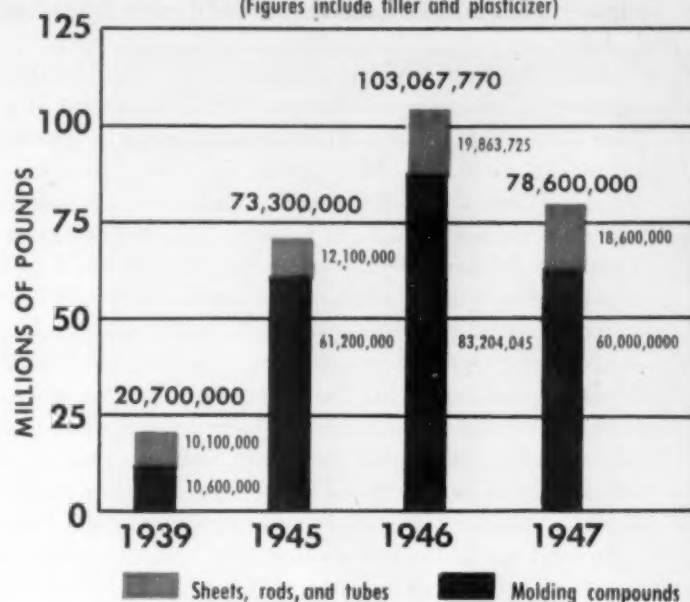
Between 7,000,000 and 8,000,000 lb. of this "under 0.003 gage" acetate was used in 1947, but it has been estimated that no more than one quarter of it was used for pre-packaging. Its use in such form is just beginning—no one can estimate what it may come to in the future although whether or not it can keep the field to itself is something other plastics may help determine.

Other uses for thin gage acetate, all of which have great potentials, are in electrical insulation, for lamination over cardboard and with vinyl for boxes, book covers, and in packaging envelopes for hosiery, sheets, pillow cases, and shirts, many of which are already packed in cellophane. The total acetate put to these uses today is tiny compared to what is expected in the next few years.

We can make no attempt to catalog all the packaging

CONSUMPTION OF CELLULOSE ACETATE AND CELLULOSE ACETATE BUTYRATE

(Figures include filler and plasticizer)



Figures for 1939, 1945, and 1946 are from reports by the Bureau of Census. Those for 1947 are an estimate based on the report of the Bureau of Census for the first nine months of the year. Cellulose acetate and mixed esters dropped from the 1946 peak due to the summer slump and competition from lower cost materials, but made a strong recovery in the last quarter. It is notable that sheeting material held its ground despite the 1947 summer recession in practically all thermoplastics

possibilities here. Closures; cosmetic, chemical, and drug containers; cap liners; coatings, such as the polyester recently mentioned for soft drink caps; plastic adhesives for various uses in packaging, all offer more and more possibilities as developers learn how to use them. Competition is expected not only from other materials but from within the plastics industry itself where the various materials will compete against each other for the customers' favor.

[Editor's note: Because of the tremendous potential use of plastics in packaging, MODERN PLASTICS will present in the near future a complete and comprehensive survey of the entire field.]

Ethyl cellulose

ETHYL cellulose production fell severely in 1947; indeed, the Government stopped publishing figures on it after April when consumption had dropped to under 400,000 lb. a month. The total for the first four months was 1,700,000 lb. There are some odd factors involved that complicate the situation. The Government could not get enough ethyl cellulose during the latter part of the war when it was wanted for the proximity fuze and for possible use as an inhibitor strip on rockets. Ex-

pansion was planned to a nearly 1,000,000 lb. monthly capacity, but it did not all come in until some time after V-J day.

Then the Government was left with a considerable quantity of molding material and sold it as surplus at a later date when it was not particularly needed. In the meantime, molders had to learn how to use this new material. When all plastics became scarce, ethyl cellulose was consumed at a rate of between 600,000 and over 1,000,000 lb. monthly for some time. The war's end also ended a great portion of the use of ethyl cellulose as a dip coat to prevent corrosion on metal gears, axles, etc., during shipment and storage. The cancellation of these big end uses, plus the dumping of surplus stock, plus the sudden and unexpected plentiful supply of less costly acetate and polystyrene last Summer, put ethyl cellulose in an embarrassing spot; but producers report that, like all other plastics, it came back strong last Fall.

In contrast to the other cellulose, ethyl cellulose is an ether rather than an ester, which gives it certain inherent chemical advantages. It has great toughness and high impact strength over wide temperature ranges. It is internally plasticized, which means that it can be molded without a plasticizer, a method which so far, however, has not been found practical. Normally, from 10 to 15% plasticizer is used, which compares with the 25 to 30% used with most other cellulose. Moreover, ethyl cellulose is compatible with a wide range of plasticizers, resins, and oils, while acetate is confined largely to phthalate type plasticizers.

Weight is also an advantage since ethyl cellulose has a specific gravity of 1.1 in comparison with 1.2 for butyrate; 1.3 for acetate; and 1.2 for propionate.

Because of its several advantages, producers feel confident that ethyl cellulose will always have a functional market. The principal advantages, such as low-temperature impact strength, high-temperature humidity resistance, and dimensional stability plus excellent dielectric properties, are most desirable qualities. Its electrical possibilities are illustrated by its use as insulation for ignition cables, particularly those used at high altitudes and at temperature extremes.

Some difficulties have been encountered in molding ethyl cellulose, but those who have been successful with it say most of the faults can be eliminated by close control of temperature, pressure, etc. There is still some trouble with color and finish, but such things are to be expected with any new plastic until further development corrects them.

One of the more interesting applications of ethyl cellulose during the year was in a hearing aid housing where it was chosen over all other materials because of toughness, acoustical and electrical properties, and dimensional stability. Incidentally, those same properties have made it a successful material for radio cases, but the cost factor has been a little tough to overcome. Close kin to this field is its potential use in television sets as a frame for the picture. In such applications it would require from 6 to 8 oz. per unit.

Another big potential market is in molded evapora-

tor frames for refrigerators. This application got its start when a manufacturer used it on his export jobs because of less breakage in shipment; it is now being applied to domestic refrigerators where low temperature toughness is important. The job requires about 18 oz. per unit.

There is every likelihood that ethyl cellulose may go into more and more appliance housings where toughness or dielectric qualities are needed, and into such applications as vacuum cleaner parts where it could replace metal and have the added feature of light weight.

One of the most interesting applications of ethyl cellulose is in phonograph records where it is used in combination with vinsol resin to replace shellac and make a tougher record. This development has been moving quietly along for some time with no one mentioning it; but ethyl cellulose producers believe it is permanent. The records sell at the same price as shellac records.

The two producers of ethyl cellulose flake are devoting increasing energy to developing its use as a packaging film. By the end of 1948, they expect to see a respectable poundage used for this purpose and have their eyes on the fresh vegetable market as well as on certain products such as cheese where the properties of ethyl cellulose are particularly desirable.

Phenolics

CONSUMPTION of phenolic materials in 1947 was beyond anyone's expectation. There were large increases in every single category, and molding powder alone gained a total of 140,000,000 lb. in 1946 to almost 200,000,000 lb. in 1947. Record months of almost 18,000,000 lb. became commonplace and, after March, monthly consumption was never less than 15,000,000 pounds.

A glance at the reports of the various raw material phenolic molding powder suppliers in the article, "Expansion plans," on page 72 indicates that nearly all companies who produce phenolics expect to have increased capacity in 1948. Further it is rumored that a company not heretofore in the phenolic resins business is also coming into the field. One wonders where all this material is going to be used, but everyone wondered also what was going to be done with the 12,000,000-lb. capacity that the phenolic molding industry had at the end of the war. Despite this great consumption of molding powder, a great many molders are crying for more business and assert that they have idle press time.

The amazing increase in the production of phenolics was made possible despite shortages of phenol, formaldehyde, and almost every other material used by the industry. The shortage in phenol persisted even though its production assumed record-breaking proportions, with the month of July—25,000,000 lb.—higher than any other month on record.

One producer believes that phenolics may continue

in short supply for about three years provided there is no world-wide business slump. He bases his belief on the raw material situation and points to new uses coming along that will take up huge quantities of phenol such as a new phenolic roofing and wall siding material. Increasing new uses for cresol as an oil additive will also affect the phenolic laminate and varnish field.

The formaldehyde situation looks as though it would ease in 1948 when considerable new capacity is expected to come in, and more methanol will be available from which to manufacture formaldehyde. Methanol has been particularly tight during the past year because of its use in anti-freeze. The problem here is that the same amount of this material is now expected to serve 20% more cars this year than last.

There will be more methanol by the first of April; in fact, if the Government should stop shipping ammonium nitrate, which is made in plants that might be converted to methanol, there might suddenly be more methanol than anyone would know what to do with.

The formaldehyde situation, like most others in the chemical industry, has been affected by the use of formaldehyde for other purposes, such as pentaerythritol in protective coatings; with urea as a glue; and in phenol formaldehyde glues.

The principal reason for the increase in the use of phenolic molding powder is a belief that molders are operating much faster and on larger pieces than ever before, largely due to transfer and plunger molding plus preheating. Washing machine agitators, for example, are now being molded faster than die-castings can be turned out. A 13-lb. record player cabinet can now be turned out in 3 min.—before preheating it would not have been an economical undertaking. In fact, presses have generally doubled their capacity by the use of preheating methods.

Not only has this affected the larger pieces, but it has increased the speed of molding small items, such as bottle caps and radio tube fixtures.

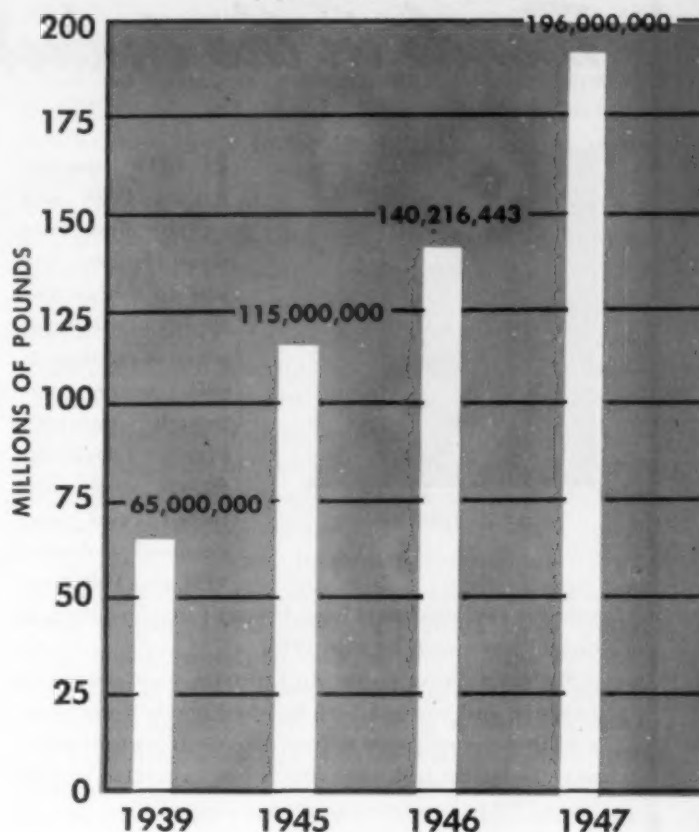
Toward the close of the year, it seemed that the backlog of orders had disappeared but molders were still using a tremendous amount of material, and the tool shops are full of new molds. Nevertheless, there is a feeling of uncertainty in the industry; there is a fear that the saturation point has been reached for many phenolic molded pieces.

One expert points out that there never was a greater opportunity for far-seeing engineers than in today's phenolic situation. He claims that the time is approaching when molders must start to dig up new ideas and new designs for the simple reason that both the capacity of presses and the availability of raw material are going to be far greater than ever before, and new outlets must be sought.

Any designer should now remember that phenolic molded pieces of 5 lb. and up are going to be as commonplace in the future as light sockets were in the past. This trend is now only embryonic. Other promising possibilities are found in glass fiber mat molding with wood-filled phenolic material. Interesting develop-

PHENOLIC MOLDING MATERIAL CONSUMPTION

(Figures include filler and extender)



The figures for the years 1946 and 1947 are based on Bureau of Census reports with the last three months of 1947 estimated. Phenolic molding powder production exceeded all expectations in 1947 and would have gone even higher if more raw material had been available

ments already well underway are phenolic table tops and chair seats.

The above-mentioned commentator stated that these examples are only tiny indications of what must come and that the designers and engineers in planning for the future should also study what had been done before. He pointed out the example of the Armed Services' binoculars case which was molded to dimensions and tolerances never held before. Despite this achievement, not a single commercial application like it has been designed. If the present capacity of the industry is to be utilized, there is plenty of work ahead for those who plan the industry's progress.

Polystyrene

THE future for polystyrene looks to be at least as promising, if not more so, as that of almost any other plastic. The consumption of around 92,000,000 lb. in 1947, a 37% increase over 67,000,000 lb. in 1946, is in no sense an accurate measure of the long-time expansion to be expected in this material. Its low price of about 25¢ per lb., plus its adaptability for molding, to emulsions,

Trends in the industry

by J. R. HOOVER*



J. R. HOOVER

IT NOW appears that 1948 will be the first year since before the war in which the supply of all major plastics materials will nearly approach demand. Plant facilities which were projected and announced during 1945 and 1946 have

now for the most part been brought into production or will have been by mid 1948.

We are talking about an industry now geared to produce and convert into finished goods more than a billion pounds annually of chemically made basic materials; an industry which has expanded sixfold since 1939 to become a major segment of the national economy and is still growing.

Let's not forget that much of the huge investment in plastics has been committed to materials so new that market surveys have been based largely upon intelligent imagination. Considering the speed at which this industry has expanded, is it any wonder that many things have been out of balance?

With supply and demand coming into better balance after completion of planned basic facilities, we shall perhaps begin to see in 1948 what the real digestive capacity of our economy is for all these widely different materials we call plastics.

There is no reason to believe that the future of this industry is limited by any known horizons. Many of our growing pains are self-corrective. Consumer skepticism, stemming largely from misapplications of plastics, is going to be a very healthy thing for us. Whereas consumers during past

* President, P.M.M.A. and vice-president, B. F. Goodrich Chemical Co.

shortages have been in the main neither price nor quality conscious, they are now rapidly becoming both price and quality conscious.

Already there is apparent a more conservative and more specific approach in plastics advertising, publicity, and promotion. These versatile materials we are dealing with are plenty good enough to sell on merit, without exaggeration.

More and more it is realized how great are the differences among the types and end uses of plastics. The fact is dawning upon us that the differences are often more important than the similarities. We are beginning to see that the habit of calling these materials simply "plastics" has been to some extent a handicap to progress, a snare for the unwary, a delusion for the ignorant, and a too convenient hiding place for the unscrupulous. There is also a growing realization that some of the biggest and best fields for plastics are in combination with other materials, rather than simply in competition with other materials.

The past year has seen no slackening of pace in the technological progress of the plastics industry. Improvements in materials, processing equipment, fabrication, and design in 1947 will have significant influences on the plastics products of 1948. The introduction of new material forms which lend themselves to simpler processing or fabrication and make possible a wider range of use will also have great effect upon the trend of plastics business. With labor and plant costs so high there is great incentive to develop simpler methods.

With the materials supply prospect for 1948 better than at any time since pre-war, the processor, fabricator, designer, and merchandiser can confidently make long-range plans based upon functional and economical selection of materials, a situation which points toward a strong future. Our industry's growing pains will be forgotten as it swings into a more mature and competitive phase.

and for other purposes, makes its future beyond measure at the present time. By the end of 1948, there should be annual capacity for at least 200,000,000 lb. of molding material, and perhaps more, although one of the more conservative members of the industry does not expect consumption in 1948 to be more than 25% over 1947, or approximately 115,000,000 lb.

Dow has expanded its facilities; Monsanto has announced an expected capacity of 80,000,000 lb. when its program is completed some time in 1948; Bakelite

has announced a capacity of 25,000,000 lb. effective some time during 1948; Koppers has announced at least a 15,000,000 lb. program for completion late this year; and several other companies are producing polymer on a smaller scale. Furthermore, once a plant is built, it is comparatively easy to increase capacity by adding new units.

The industry was handicapped in 1947 by the destruction of the Monsanto monomer and polymer plants at Texas City. Despite the comparatively small

amount of monomer needed for polystyrene (1.03 lb. of monomer for 1 lb. of polymer), the industry was threatened with a shortage of monomer at the end of the year, and one company at least was forced to put polystyrene on an allocation basis. October consumption of the polymer broke all records with an 11,000,000 lb. total.

The greater portion of monomer production during the war was used for synthetic rubber, which runs 75 parts butadiene to 25 parts styrene. The Government has steadily cut back its synthetic rubber production, but started boosting it up again in the latter half of 1947. So far, it is impossible to tell what is going to happen about this situation. Mr. P. W. Litchfield, chairman of the board of the Goodyear Tire and Rubber Co., says the Government should make only 100,000 tons of synthetic rubber, with capacity for several hundred thousand more tons kept in stand-by condition. Others have maintained that a minimum of 250,000 tons should be made annually in the United States, and still others insist that the eventual production of synthetic rubber should be anywhere from 250,000 to 500,000 tons. At any rate, styrene production is directly influenced by the synthetic rubber program.

Styrene monomer production is dependent upon the availability of benzol and ethylene. Benzol came in better than expected in 1947 to the amount of about 165,000,000 gal., exclusive of motor benzol. This is the best peace-time production ever recorded; the production of motor benzol dropped to less than 1,000,000 gal. a month in 1947 while before the war it exceeded other grades.

Ethylene has been getting shorter and shorter, and this shortage is thought to be largely responsible for the threat to styrene monomer production. Ethylene has many uses, such as in ethylene glycol for anti-freeze and for use in the manufacture of detergents and other chemicals. It so happens that ethylene used for these purposes generally commands a higher price than when it is used in styrene. Great quantities of ethylene are manufactured by Carbide and Carbon, Dow, Monsanto, and others, but apparently these quantities are not nearly enough. In any event, it is understood that several of the ethylene producing companies are planning to expand their facilities so that the shortage will be remedied during the year 1948.

The total styrene production capacity in the United States in November 1947, as rated by Government sources, was about 21,000,000 lb., although it is known that the Government rating is low. Nevertheless, the styrene plants have been producing over a range of from only 18,000,000 to 26,000,000 lb. per month since the Texas City disaster. In November, it would have required 16,000,000 lb. of styrene for synthetic rubber alone and nearly 11,000,000 lb. for polystyrene. The shortage is obvious and alarming, unless synthetic rubber production is cut still more. The Texas City plant is due to come back during March or April, but if built to its former capacity of 100,000,000 lb. a year, or a little over 8,000,000 lb. a month, there is still not going

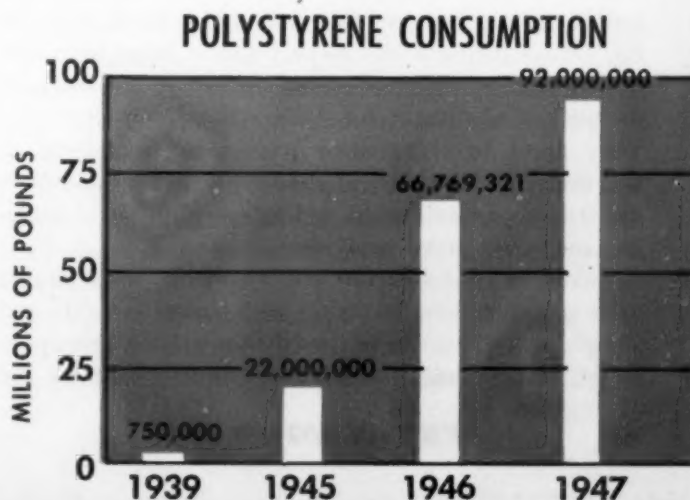
to be much margin for use in polystyrene if synthetic rubber production continues in the neighborhood of 400,000 tons annually. This situation points up the immediate shortage and gives pause to wonder just where the styrene is coming from if today's consumption of polystyrene should double in 1948. The complex answer seems to be dependent on the following major factors:

1) An increased quantity of ethylene and perhaps benzol. About 3,000,000 gal. of benzol is needed for 21,000,000 lb. of styrene, but benzol has so many uses that any further expansion of any one of its markets, such as styrene or phenol, would make a difficult situation, and there is scant hope for a further increase in benzol production unless the petroleum people bring it in, and that would mean higher prices.

2) A decrease in the amount of synthetic rubber now manufactured, which is a problem involving politics, tariffs, and national defense.

3) More styrene monomer production. Some authorities claim that the Texas and Kobuta plants could be operated at anywhere from 25 to 75% more than their Government-rated capacity, but that fact is yet to be proved. Last Summer they ran at slightly over rated capacity, according to production figures of the Tariff Commission, but claim is made that they curtailed operations because of decreased styrene demand. Another possibility for more styrene production soon is the prospect that Carbide and Carbon will open the Institute, W. Va., plant, where it manufactured butadiene and styrene during the war. This plant, which Carbide and Carbon purchased from the Government

Last two years' figures are based on Bureau of Census reports; the last three months of 1947 are estimated. Polystyrene made a good advance in 1947 but not quite as much as expected due to summer slump and possibly to monomer troubles after the Texas City disaster. However, consumption began to increase at a rate of 1,000,000 lb. a month in September, and customers complained of shortages of material. Capacity for 1948 may reach as much as 200,000,000 lb., but consumption depends upon how soon new plants are finished and upon the demand for new applications



last Summer, was closed down immediately following the war because its styrene production cost was considered high. However, officials comment that this high cost was largely due to the fact that they had to use ethylene from alcohol; they plan to reopen the plant soon and use ethylene from gas, thus lowering the over-all cost.

There is considerable speculation in the industry on a possible change in the price structure of polystyrene: one can get bets on either side of the argument that it will go up or down in 1948. The monomer at around 13¢ and lowest cost polymer at 24¹/₂¢ gives more than a 10¢ per lb. operating margin; but polymerization is a tricky business requiring complicated equipment. It is certainly possible that the spread may be narrowed at some future date, but in today's rising cost era, it does not seem likely in the near future. Benzol alone has gone up several cents a gal. in the last two years; other costs have maintained a steady rise. There has been talk by some of the larger molders of putting in their own polymerization plant. To be economical, such plants would have to have capacity for 10,000 or 15,000 lb. a day and would always face the possibilities of price cuts by the larger producers or production lags which would send their costs up.

Some molders have attempted to cut costs by buying clear crystal and doing their own coloring but from what we can learn their experiments have not always been happy. Coloring polystyrene successfully seems to be a difficult operation; it is done in several different ways, and exact processes are not made public. The difficulty of preventing contamination is only one of the more serious problems involved. Pigment can be placed in the monomer, but most coloring is done, by big producers as well as molders, by compounding crystal with pigments. Dyes are sometimes used, but they may not withstand the heat in injection presses.

The contamination problem is especially difficult to overcome in a small operation, and the molder who colors his own frequently comes out with a color that he never would accept from one of the large producers.

The biggest things to watch in polystyrene's future are the development of new markets and of various types of formulations. A versatile material, both monomer and polymer can be altered or copolymerized with other chemicals to do a multitude of things. The outlets for molded materials have so far followed closely in the footsteps of other plastic molded materials, simply because this was the natural thing to do. Toys in particular have taken a large quantity of molding powder, but producers insist that the percentage of the total for toys is not overwhelming. They point to refrigerator parts, electrical fixtures, and housings for electrical appliances such as vibrators and razors, as well as to adding machine parts, milking machine parts, and similar uses.

Boxes of polystyrene are receiving considerable attention. Molded boxes for such things as candy and cheese, and which can be used afterwards for other purposes, have made a significant contribution to the

packaging industry, but the boxes must come in several hundred thousand lots in order to pay for the mold. A further addition to packaging in 1947 was found in extruded polystyrene sheet of thin gage which can be drawn into boxes of complex shapes and sizes. It is believed that polystyrene closures, especially when treated with Logoquant or similar materials which help to prevent staining and scratching, may make a big splash. These, added to other plastics closures, will certainly have a definite effect on metal closure production.

Radio cabinets of polystyrene received considerable attention in 1947. Electrical qualities, color, and price were deciding factors. One molder is working on 10 different polystyrene models; molds for two of them have been running steadily for weeks.

In May 1947, the Monsanto Chemical Co. brought out what they call a "boilable" polystyrene under the name of Lustrex, costing about 5¢ more than regular polystyrene.

It is expected that in 1948 Monsanto will begin promotion of Cerex, a copolymer resin which they announced a couple of years ago and for which they are going to claim unusual heat resistance for a thermoplastic. Rumors say that it will be in the 50¢ price range. Also, Mathieson Alkali is expected to place dichlorostyrene in the field some time this year.

One of the most unusual applications of polystyrene during the past year was in wall tile. At present, tile is probably taking more volume than any other one item. When first introduced, there were a lot of fingers crossed, but the idea caught on, and at year end, it was all the rage. Even a new trade association was formed to look after the new industry's welfare.

But the path for tile was not all smooth. First, there was an adhesive problem; the adhesive would show through, but that was overcome by improving opaqueness or providing a special mat surface on the tile.

Then there was a howl about scratching or crazing, but it was pointed out that other types of tile also scratch and that the housewife can be educated to omit abrasive cleansers when washing her tile. There is still the problem of heat effects around kitchen stoves and bathroom radiators, but the answer is not to try polystyrene tile in such spots: use other materials where heat is high. Furthermore, polystyrene tile is strictly a product for the home and should not be used in public places where it would be subject to abuse.

The greatest problem foreseen now is that too many molders have jumped into the tile field with no adequate plans for distribution. The product is distributed largely in communities surrounding individual molders, who are going to be over-inventoried soon if they do not get into national distribution. This is an expensive process not too well understood by many individual molders. One or two big operators with national distribution of other materials are getting into the field, however, and may save the day.

Another big prospective use for polystyrene is in Styrofoam, which the Dow Chemical Co. thinks is des-

tined to go places in building construction. A $\frac{1}{2}$ -in. thick slab of this material fastened to cinder block with Portland cement or asphalt type mastic serves as an ideal thermal insulation as well as a plaster base, eliminating the use of lath or other insulating materials now commonly used. Delay in promoting this outlet was caused by a lack of material but, if successful, it certainly has a tremendous future. Styrofoam is also recommended as an insulating material for walk-in lockers or freezer plants where cork is now used. It is not likely to get into the domestic mechanical refrigerator which is well sealed against moisture and can use a less costly insulator.

Polyfibre is thought to be dead. Used for radar housings and battery separators during the war, it was successful, but few practical civilian applications have been found.

Brush bristles are made from polystyrene on the West Coast, and it is still possible that this application may be developed to a greater degree than presently thought practical.

Another potential use of polystyrene is with glass mat in compression molding. A sample relay cover has been shown that can be molded at the rate of six per minute with only 40-lb. pressure. The material has to be handled differently than wood-filled phenolic but can still be molded on a compression press. Such a material has numerous desirable qualities, but the greatest is probably its strength. Developers think it can easily compete with metal for such things as scale housings and for combining with other materials for use in structural work.

These are only a few of the possibilities in store for polystyrene. It has certain weaknesses such as brittleness, slow molding time, and weld lines that are difficult to avoid, but it is probable that special formulations will gradually improve the material. In fact, it is expected that even buttons will some day be made from polystyrene which will eliminate the complaints put forth by dry cleaners last year.

Combined with other materials, polystyrene produces copolymers that show possibilities of greater elongation and better tensile strength. Another improvement is the use of annealing after molding to relieve strain. This is particularly effective in such things as switch plates for home use. Luminescent pigment is now being used in polystyrene to produce shields for tubular lighting units, switch plates, toilet seats, etc.

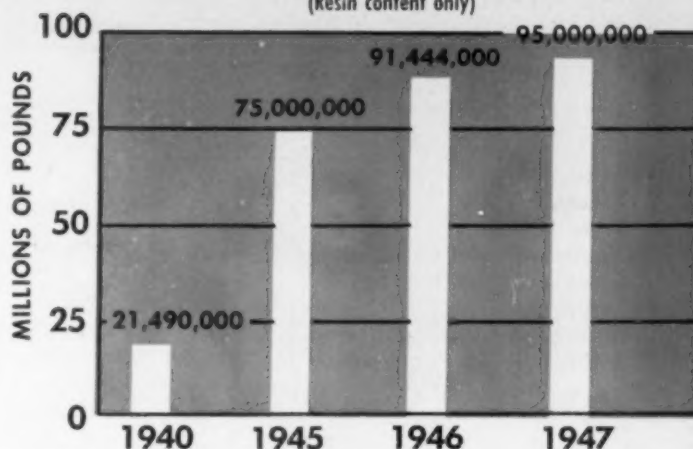
Unfortunately, no one has been able to plasticize polystyrene to any extent and thus gain improved qualities, but there are advantages in having a thermoplastic material that needs no plasticizer.

Polystyrene's possibilities as a protective coating, in emulsions and adhesives, and as a laminating agent are all on the docket and, in some cases, are already in good sized production.

In the infancy of development is the use of styrene monomer as one element of a copolymer. Already some of the large rubber companies are developing and exploiting a high styrene-butadiene resin and other com-

UREA AND MELAMINE CONSUMPTION

(Resin content only)



These figures are estimates based on Tariff Commission and Census reports. They are broken down only in wide categories in official publications. Unlike most other figures given, they do include protective coatings because it is impossible to separate them. The latest published protective coating figure for urea was 5,000,000 lb. in 1945. Molding powder is reputed to have been running from 30,000,000 to 35,000,000 lb. for several years, with demand well ahead of supply. Only about half that amount is resin—the balance is filler. The industry has been held back by shortages of urea crystal and formaldehyde. Facilities for doubling current molding powder production are now believed available

binations with styrene. These have amazing properties according to experimenters who find them capable of doing many things now done by the polyesters but with the additional characteristics of molding properties that may make them generally accepted all-around materials in the future, with particular emphasis on high impact strength. Considerably more will be heard about them by the end of 1948.

Urea and melamine

THE situation for these materials is just about the same as it was at this time a year ago. New facilities have been added which will double capacity, but the shortage of formaldehyde and urea crystal has prevented full use of the available capacity. In the Du Pont expansion report on page 73, it will be noted this company asserts more urea will be available by next September. More formaldehyde will supposedly be available early in 1948.

Melamine is available in quantities that are sufficient to produce enough of the molding materials and resins made from this compound to take care of anticipated demand.

Producers of these materials state that during 1947 they lost ground to thermoplastic materials in some applications, but the slightly increased availability of

Table II-Manufacturers' Shipments and Consumption of Plastics and Synthetic Resins*, Exclusive of Protective Coatings, for 1946 and 1947† in Pounds.

	1946	1947
Cellulose acetate and mixed ester plastics^a		
Sheets		
Continuous (under 0.003 gage)	7,649,795	7,200,000
Continuous (0.003 gage and upward)	7,498,529	7,800,000
All other sheets, rods, and tubes	4,715,401	3,900,000
Molding and extrusion materials	83,204,045	60,000,000
TOTAL	103,067,770	78,900,000
Nitrocellulose plastics^a		
Sheets	10,932,131	9,000,000
Rods and tubes	7,228,862	3,600,000
TOTAL	18,160,993	12,600,000
Other cellulose plastics^{a, b}	12,183,113	4,000,000^b
Phenolic and other tar acid resins		
Laminating (dry basis)	27,725,337	40,000,000
Adhesives (dry basis)	16,120,513	20,000,000
Molding materials ^a	140,216,443	196,000,000
All other, including casting (dry) ^{a, c}	58,201,169	62,000,000
TOTAL	242,263,462	318,000,000
Urea and melamine resins		
Adhesives (dry basis)	40,797,108	47,000,000
Textile and paper treating (dry basis)	13,534,368	16,000,000
All other, including laminating but exclusive of molding powder ^{a, c, d}	3,896,580 ^c	7,200,000
TOTAL	58,228,056	70,200,000
Polystyrene^{a, e, f}	66,769,321	92,000,000
Vinyl resins		
Sheeting and film, including safety glass sheeting ^a	52,079,495	63,000,000
Textile and paper coating—resin content	11,673,212	16,000,000
Molding and extrusion—resin content	61,852,162	74,000,000
All other, including adhesives but excluding protective coatings ^a	27,082,895	27,000,000
TOTAL	152,687,764	180,000,000
Miscellaneous resins^f		
Molding materials ^{a, f}	50,000,000	54,000,000
All other (dry basis) ^{a, g}	35,689,921	31,000,000
TOTAL	85,689,921	85,000,000
TOTAL	739,050,400	840,700,000

* Based on Bureau of Census, Dept. of Commerce, reports for 1946-1947.
† Last three months of 1947 estimated. ^a Includes fillers, plasticizers, and extenders. ^b Includes ethyl cellulose and related plastics. ^c Excludes data for protective coating resins. ^d Excludes urea and melamine molding materials; see footnote/. ^e Dry basis, including necessary coloring material. ^f Includes data for urea and melamine, acrylic acid, and miscellaneous molding materials. ^g Includes data for petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials. ^h Figure for 1947 estimated—Census no longer gives figures for this material. ⁱ Adjusted for one company's production affected by a month long strike. ^j An estimated figure in 1946 for entire year due to overlapping and change in method of reporting.

urea and melamine has resulted in many of these products being returned to the compound for which the molds were originally designed.

Consumption of the various melamine compounds, including rag filled, alpha-cellulose filled, and wood-flour filled, has gradually increased during the year. Improved compounds, together with greater exploitation of their particular properties, have resulted in a number of growing markets, most outstanding of which is probably tableware. Several large molders have entered this mass market.

Melamine laminating resins have been increasingly used in 1947, particularly in the decorative laminating field.

Melamine and urea adhesives for plywood and wood products, particularly those which comply with rigid specifications on boil resistance and durability, have been used in ever increasing quantity. They have proved economical to manufacturers who must guarantee high-grade waterproof plywood, durable boats, or a permanent bond in any wood product which will be exposed to weathering.

Vinyl resins

THE vinyl industry did not grow as much as expected in 1947 due to the Summer slump and to inability of new plants to get into production. Nevertheless, the poundage of somewhere near 180,000,000 lb. was second in plastics in 1947 only to the entire phenolic group. This is a rather remarkable record for a material that was scarcely in evidence in 1939 and was unavailable for civilian use during the war. Consumption fell from 17,000,000 lb. in January 1947 to around 11,000,000 in June but picked up from there and hit a remarkable 18,000,000 lb. in October. The industry is as resilient as the material it produces, probably due to the remarkable properties of vinyl chloride and copolymer resins which make them eligible for use in a multitude of applications. If consumption falls off in one market, the lost poundage is soon transferred to another.

When production for film falls off, something will turn up for an increased use in the extrusion or some other field. Last Summer when over-all poundage was dropping, someone discovered that polyvinyl acetate made intriguing balloons, and 400,000 lb. was diverted to that purpose in one month, with a resounding squawk from other acetate users when they discovered that a plentiful material had become tight.

It would be useless to guess what consumption will be in 1948, but there will be more capacity than in 1947, and a lot of people are going to be disappointed if consumption doesn't go well over 200,000,000 lb. The big items among the various vinyls are vinyl chloride and copolymers, which accounted for around 120,000,000 lb. of the total 1946 production and perhaps 150,000,000 lb. of the 1947 production.

The two major producers, Bakelite and Goodrich Chemical Co., have doubled their capacity. The

Glenn L. Martin Co. expects to come in with a 25,000,000-lb. capacity plant in 1948, half in March and the balance in the Fall. Goodyear is already in production, but rate is not known. Monsanto Chemical Co. will start production of a vinyl chloride type called Ultron probably before mid-Summer, but has not announced its capacity. Firestone is due to come in during the Spring. The capacity of all these plants may be as much as 235,000,000 lb. or more annually when they are completed, but that doesn't seem possible in 1948. There are several companies which produce monomer in varying quantities, but these have given no inkling as yet that they plan to branch out into the polymer or copolymer fields.

Other polyvinyls such as alcohol, butyral, acetate, formal, and carbazole are produced in comparatively small quantities, but Niasset has announced a new plant for vinyl acetate monomer which is used in substantial quantity, perhaps 20,000,000 lb., for copolymers with vinyl chloride, adhesives, and in the manufacture of polyvinyl alcohol and polyvinyl butyral. Polyvinyl alcohol is used largely for adhesives and paper treatment and polyvinyl butyral for production of safety glass, coated fabrics, and protective coatings for metal. Formal is used largely as insulation. Carbazole in small quantity is used for various electrical applications.

The primary outlets for vinyl chloride materials are still in about the same class as last year. Wire coating heads the list, but not by a great margin, and some producers believe the field may be approaching saturation. Another producer looks for an even greater expansion in this market through a greater use of vinyl insulation in home, automotive, and electrical appliance wiring.

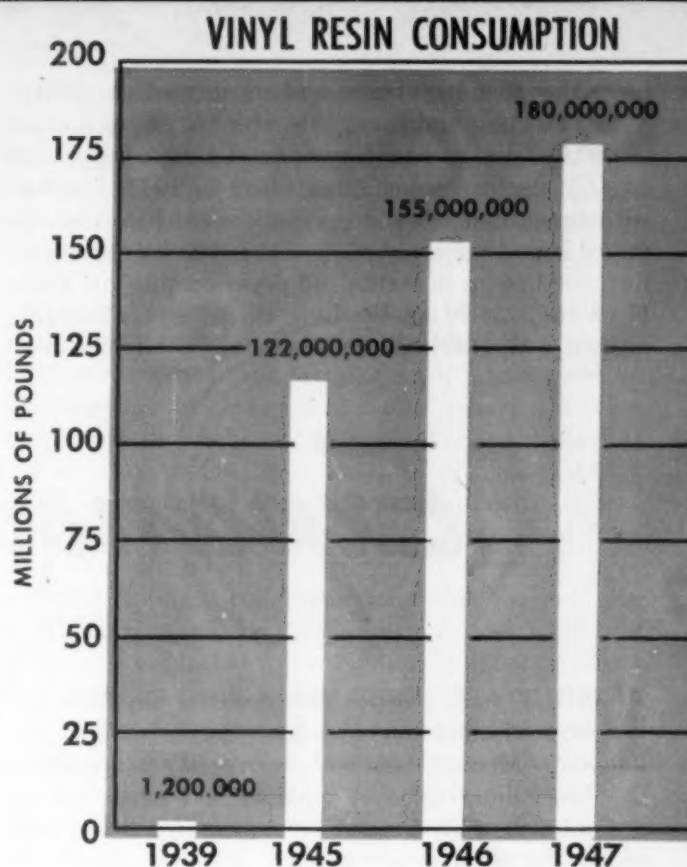
The other chief outlet is in calendered sheeting, film, and coated fabric. It is believed by mid-Summer vinyl flooring will be widely distributed and eventually will become one of the industry's greatest outlets.

In the sheeting and coated fabric fields, the industry has made great strides in the past year, especially in increasing its unsupported sheet output. Large portions of this material are now going to upholsterers, although they still need education to convince them it should be sewed with fewer stitches to the inch, with

Table III.—Percentage and Amounts of Vinyl Resin Used for Film, Sheeting, and Coated Fabric in 1947

	%	lb.
Household use, including nursery items	36	19,800,000
Upholstery	34	18,700,000
Wearing apparel	10	5,500,000
Handbags	8	4,400,000
Covering for luggage, radios, etc.	3	1,650,000
Wall covering	2	1,100,000
Yard goods	2	1,100,000
Bookbindings	1	550,000
Miscellaneous	4	2,200,000
Total amount of resin:		55,000,000 ^a

^a This figure was obtained by deducting 33 1/3% of the 63,000,000 lb. of compound used for film, sheeting, and coated fabric and then adding 85%, or 13,000,000 lb. of the amount of solid resin used for textile and paper coating shown under vinyls in Table II.



Consumption figures for 1939 are estimated. Those for 1945 and 1946 are based on Tariff Commission figures which include resin content only, but do contain a negligible amount of resin for protective coatings. Figures for 1947 are based on the first nine months of the Census Dept. Report. Tariff Commission figures are not available for 1947. Vinyl resin figures are complicated by various reporting methods. The Census Dept. figures are resin content only, excepting film and sheeting reported on a compound basis; thus the 52,000,000 lb. of compound reported for this purpose in 1946 probably contained almost 20,000,000 lb. of plasticizer and filler

round needles, and carefully handled around sharp corners. The automotive industry is still on the prospect list for more vinyl upholstery and trim even though it is presently absorbing a goodly amount.

Other applications for vinyl sheeting are patent plastic, largely for handbags, book binding, luggage covering, wall covering, etc. The term "sheet" is generally applied to unsupported material of 10 mil thickness and over. The story of the handbag is typical of what happens to vinyls. Two years ago a vinyl plastic bag was looked upon as a substitute; users, after experience, have now learned that it is better than the material for which it was substituted. The material provides an improved, scuff-resistant item to which a "New Look" can be applied by simply cleaning it up. Furthermore, vinyl sheeting can now be supplied to the mass market in bags selling for under \$5, yet it is believed that style designers will also continue to use planished vinyl sheet

for higher cost bags because of its proved durability.

The sheeting and film fields which used up around 60,000,000 lb. of vinyl compound (including about 33 1/3% plasticizer and other filler) in 1947, together with the coated fabric consumption which can be obtained by taking about 85% of the 16,000,000 lb. used for "vinyl resins in textile and paper coating" in Table II or, say, 13,000,000 lb., have stirred up considerable interest. Research men have been busy all year look-

ing into their possibilities and making surveys for companies who have their eyes on these fields.

Our survey indicates that 88% of the operators in the sheeting and film business expect to expand in 1948. They make the materials used for shower curtains, unsupported sheet and coated fabric for upholstery, and dozens of other things. Bowl covers alone would be a nice business if one company had all the market. From a survey made of the industry, (*Please turn to page 156*)

Expansion plans

NEARLY ALL plastics raw material suppliers announced expansion plans immediately following the war. Most of them have been sorely disappointed by their failure to meet building and new facilities schedules, but by the end of 1948 it is believed that practically all of these will have been completed. In the following paragraphs, we have attempted to gather all these various announcements and give the reader as much information as possible on the programs of those companies willing to make their plans known.

American Cyanamid Co.—Cyanamid's extensive plant development and expansion at Wallingford, Conn., is very nearly completed. After many delays brought about by shortages of labor and material, the company now possesses operating facilities which permit a capacity more than double that of 1940, as far as Beetle and Melmac molding materials are concerned. Production of resin adhesives and laminating resins is also possible at a rate two or three times greater. However, the plant will not operate at capacity because essential raw materials are still in short supply.

American Molding Powder and Chemical Corp., Brooklyn, N. Y., is continuing its expansion program for polystyrene and cellulose acetate molding materials and is now supplying a complete range of crystal clear, transparent, translucent, and opaque cellulose acetate and a special formulation for extrusion purposes. Additional equipment is being installed to increase the capacity for coloring polystyrene. The 1948 program provides for enlargement of its selling organization, with special attention given to export orders.

Bakelite Corp.—This company reports a number of projects nearing completion for expansion of its varied line of plastics. Facilities for production of all plastics and resins marketed by the company will be increased by 50 to 60 percent.

The announced new plant at Ottawa, Ill., which will

process vinyl resins into plastic film, sheeting, and rigid sheets, has been built and small-scale production is already under way. The plant is expected to be in full production by Spring of 1948.

The production of Vinylite resins at the South Charleston, W. Va., plant has been substantially increased, and the new Texas City, Texas, plant, which also produces Vinylite resins, is now in operation.

The recent price reduction of Bakelite polyethylene, ranging from 4¢ to 7¢ per lb., was made possible by the greatly increased output of polyethylene resin at the South Charleston, W. Va., plant.

At the Bound Brook, N. J., plant continued expansion is taking place. By June 1, the plant will be ready to produce polystyrene at the rate of 25,000,000 lb. annually. All production of polystyrene at Bloomfield is being transferred to Bound Brook.

By May 1, the facilities for making phenolic molding materials will be increased by about 30 percent.

The new development building announced last year is scheduled for completion in early 1948.

At Monterrey, N. L., Mexico, a new plant, operated under the name of Bakelite, D. F., Mexico, began operation the latter part of 1947. This plant produces only general-purpose phenolic molding materials but also serves as Mexican sales agent for all Bakelite products.

Another new plant is being constructed in Canada, near Belleville, Ontario. This plant is expected to be completed by the latter part of 1948. Phenolic plastics and resins and urea resin glues, at present made at the Toronto plant, will be produced at the new plant.

Casein Company of America—The recent acquisition of Durite Plastics, Inc., marks another important step in the expansion program of the Casein Company of America, Div. of the Borden Co.

Durite's addition to Casein Co.'s operations makes the latter, already a large manufacturer of resin adhesives, an important factor in industrial plastics.

Since the end of the war, the Casein Co.'s expansion has been steady. First step in its program was the

completion of a new adhesives plant at Bainbridge N. Y. A sizable portion of the old plant had been destroyed by fire. Completed in 1946, the Bainbridge plant is one of the most modern adhesives operations in the country.

Also in 1946, the Casein Company of America completed, and subsequently expanded, the first plant for the manufacture of formaldehyde on the West Coast. This operation is located at Springfield, Ore., to supply the requirements of the Douglas fir plywood industry.

Another step was the opening of a resin adhesives plant at Kernersville, N. C. This plant is designed to fill a large portion of the adhesives needs of North Carolina and Virginia furniture manufacturers.

Celanese Corp. of America—The expansion at the Newark, N. J., plant, which was delayed for some time, is expected to be completed in the second quarter of 1948. As a consequence, increased production of Lumarith film and transparent sheeting will be forthcoming. The explosion in the solvent recovery section of the transparent film department which occurred on December 15, caused a shutdown. Production, it is believed, at this writing, will be halted for two or three weeks by which time 50% operation is anticipated. Normal activity was expected to resume within five weeks. The shutdown, it was stated, would permit an acceleration of the film expansion program.

Output of tricresyl phosphate plasticizer which is also produced at the Newark plant increased in 1947. At Belvidere, N. J., substantial quantities of cellulose acetate molding material are being produced.

Several other company announcements during the past year were of interest to the plastics industry. Of major import was the disclosure that the corporation had acquired a long term lease on vast timberlands in British Columbia for the purpose of constructing a large wood-pulp producing plant in that area. It is believed that about 50% of the corporation's cellulosic requirements will be furnished by the British Columbia unit when it is completed. As a result of this arrangement, Celanese will assure itself of a steady flow of raw material for producing cellulose acetate plastics.

The Dow Chemical Co.—This company made no expansion plans for Ethocel (Dow ethyl cellulose). A few bottlenecks have been removed, permitting somewhat greater production without expanding facilities.

At the end of the war, Saran capacity was about one-third of what it is today. Further expansion had been planned which would double or triple present production, but due to difficulties in construction of monomer plants, the contemplated increase in Saran production will occur in the latter part of 1948 rather than in the early part as planned.

The construction program for polystyrene is complete. The company now has facilities for making more Styron than they are actually producing. The bottleneck is styrene monomer. The Texas City disaster last Spring curtailed national production of

styrene, and as a consequence the monomer which might now be used in Dow's present expanded facilities is going into production of polymer by others. It is expected that this situation will remedy itself in the early part of 1948 unless there is a material increase in the production of synthetic rubber.

E. I. du Pont de Nemours & Co., Inc.—Expansion of this company's capacity for manufacturing plastic materials largely awaits completion of a new plant at Washington, W. Va., near Parkersburg. Twelve months ago the company felt it would have the plant in full operation by the Fall of 1947. Construction delays which have plagued all industry now make it appear that it will not be possible to operate the plant fully until about the middle of 1948.

Facilities under construction on the 400-acre site at Washington will be for the manufacture of acrylic molding powders and nylon bristles, molding powders, and sheets, and will include a unit for compounding polythene molding powder. The company now expects its new polythene plant at Orange, Texas, construction of which also has been delayed, to be in full operation around the middle of 1948. No announcement of an over-all plastics production figure has been made.

Operation of the plant at Arlington, N. J., will be continued. Here progress has been made on plans for the manufacture of two of the company's new plastics. These are BCM, a low-pressure laminating resin, and Strux, cellular cellulose acetate, a core material for use in structural parts where lightness of weight, thermal insulation, and strength are desired. A BCM pilot plant with a capacity of 1,000,000 lb. a year recently was completed. A Strux pilot plant with a yearly capacity of 1,500,000 lb. is expected to come into operation early in 1948.

Greater output of urea crystal by Du Pont is awaiting substantial increase of production facilities now expected to be ready by next September.

Durez Plastics & Chemicals, Inc.—Expansion plans originally announced in late 1945 have been completed after numerous delays common to all the industry in the past two years. Only the continued shortages of basic chemicals have prevented full utilization of expanded facilities and considerably increased production capacity.

In addition to plants for increased plastics production at North Tonawanda, N. Y., the company has recently completed a plant at the same location for the production of a portion of its requirements of formaldehyde.

The company has also completed construction of a wood-flour plant to supply part of its needs and has increased production of its phenol plant built in 1940.

Additional construction to further increase the company's ability to supply an increasing quantity of phenolic molding compounds, resins, and varnishes is still under way.

B. F. Goodrich Chemical Co.—This company purchased from the Government the 60,000-ton capacity

polymerization plant at Louisville, Ky., which was formerly used for GR-S synthetic rubber, and has converted a portion of it into an additional source of polyvinyl chloride. This facility, which is now well on its way to full production, together with the former facilities which were available, has practically doubled company production.

The Niagara Falls, N. Y., and Louisville, Ky., Geon plants have been available for capacity operation since the beginning of 1946.

Further projects are under way in Louisville to expand production of new products, including polyblends, paste resins, and a new type of latex, early in 1948. This will enable the company to produce a substantial portion of its total production in the form of new products, which does not expand the total quantity of vinyl resins but enables the company to offer a wider range of products.

Hercules Powder Co., Inc.—When the present expansion program is completed, Hercules cellulose acetate flake production facilities will be doubled. Half of this expansion came into operation at the end of December 1947. The other half will be completed by the middle of 1948. The entire program is being carried on at Hercules' Parlin, N. J., plant.

Ethyl cellulose flake production capacity was increased by about 20% at the plant in Hopewell, Va., in 1947. No further plans for expansion have been announced.

Interlake Chemical Corp.—Early in 1947 this company began expanding its Waltham, Mass., molding powder plant to increase production of phenolic materials by approximately 50 percent. A similar program was authorized to cover the expansion of the phenolic resin plant at Forest Park, Ill. The company expects to realize full benefit of these expansions in the first quarter of 1948.

Koppers Co., Inc.—This company expects to be producing polystyrene at a rate of 15,000,000 lb. by the end of 1948. Also at this time, facilities for coloring this production will be in operation. In addition, styrene monomer will be available since all production will not be used for polystyrene.

The recent acquisition of the Chemaco Corp. has given Koppers two additional plastics—cellulose acetate and ethyl cellulose. These will be marketed under the Koppers' name. Installed capacity at Chemaco will permit sizable quantities of Koppers' cellulose acetate and ethyl cellulose to be produced in 1948.

In addition to plastics ready for molding, Koppers is offering a line of plastics chemicals and adhesives in 1948. Included in this list are phthalic anhydride, diethylbenzene, and divinylbenzene, made at Kobuta. The Oil City, Pa., plant will be producing diamyl phenol for the production of oil soluble phenolic resins. Other alkylated phenols and cresols will be available in the near future.

In mid-1947 the Pennsylvania Coal Products Co. became the Pennsylvania Coal Products Dept. of the Chemical Div. With this addition, a line of resorcinols, resorcinol adhesives under the trade name of Penacolite, and Catechol were offered under Koppers' name.

The Glenn L. Martin Co., Chemicals Div.—This company is scheduled to start production of vinyl resins in its new plant located at Painesville, Ohio, in March 1948. Annual capacity will be 25,000,000 lb., with that rate of production expected later in 1948 when the second half of the plant will begin operation.

The company will produce a group of products to include a series of vinyl resins, plasticizers, and stabilizers. All will carry the trade name of Marvinol.

Monsanto Chemical Co.—The \$17,000,000 program for the Plastics Div. of Monsanto, started almost immediately after V-J Day, has been about 65% completed.

In March 1947, the company started to construct facilities for commercial production of Ultron, a vinyl chloride resin. It is expected that production of this material will begin in March 1948.

Construction of a wood-flour plant was started in January 1947 and completed in the third quarter of the year. The wood-flour plant was built to insure a continuous supply and as nearly perfect a material as possible. In October of 1947, the company started to construct a formaldehyde unit which will be in operation beginning in the second quarter of 1948. With the production of wood flour and formaldehyde in Springfield, Mass., phenol in St. Louis, Mo., and melamine in the Merrimac plant at Everett, Mass., the company will be independent of outside basic chemical sources.

Facilities for the manufacture of Lustrex, an improved polystyrene, were completed in the second quarter of 1947, but this plant is not yet at total capacity although it is operating on a regular production schedule. It will not be complete until more equipment is obtained.

The balance of the program pertaining to service facilities, additional warehouses, and doubled capacity of the power plant in Springfield has been completed. In 1948 the company expects to finish up whatever is not completed of the above program and start construction of facilities and production of related products.

The Texas City reconstruction job is running ahead of schedule. The monomer plant is now about 60% rebuilt and will be finished in the second quarter of 1948. It is still impossible to tell when the polymer plant at Texas City will be completed, but some production is expected from it late in 1948. It required 20 months to build the first styrene monomer plant at this location, but it is being rebuilt in one year because of immediate availability of equipment, engineering work that had already been done, and a limited amount of underground construction that could be used in the rebuilding program. The new monomer plant will

have the same capacity as the old plant, which was rated at 50,000 tons annually by the Government.

Plaskon Div., Libbey-Owens-Ford Glass Co.—A new \$9,000,000 plant in Toledo was completed and put in operation in September 1947. This plant is designed to increase the production of Plaskon molding material and coating resins. The coating resin operation only is complete, but the plastic molding material plant will be finished some time in 1948. The old Toledo plant will be used for Plaskon resin glues.

Reichhold Chemicals, Inc.—The company will spend \$10,000,000 for expansion. During 1947 the

company opened new plants in Seattle for phenolic adhesives; in Tuscaloosa, Ala., for color pigments; in Elizabeth, N. J., for maleic anhydride; and in Switzerland and Italy for synthetic resins. New plants are reported to be on the way in Rio de Janeiro and Mexico City.

Tennessee Eastman Corp.—Shortly after the close of the war in 1945, this company announced that it expected to add 25% additional capacity for the manufacture of cellulose acetate and cellulose acetate butyrate. These facilities were completed early in 1947 when the company also announced that it was prepared to supply cellulose acetate propionate.

Processing

MOST observers believe the extrusion branch of the plastics industry (exclusive of wire coating, which is a separate business by itself) is due to make advanced strides in the near future. There are many signs to indicate that it is absorbing continuously increasing quantities of raw material. But in 1947 it was struck by the slump just as was the rest of the industry.

The returns on the MODERN PLASTICS survey for this branch of the industry were far from conclusive and extremely conflicting. The advent of vinyl and polyethylene into the extrusion field has changed the situation in both number of extruders and types of materials to an enormous extent. Rather than give a report in which we have no confidence, it is deemed best to omit the extruders at this time and prepare a more detailed article at a later date.

Molders

PRODUCTION of plastics molding materials increased about 18% in 1947 over 1946, as in Table VI, page 76. The MODERN PLASTICS annual mail survey indicates that the increase was swallowed up in one large gulp without coming close to satisfying the available molding capacity. The drop in demand for molded products during the Summer months helped, of course, to create more unused press capacity, but when the presses got busy again in the Fall, suppliers began to have trouble keeping up with demand. This situation is more surprising in compression than injection molding for it was not generally realized that compression molders had expanded as greatly as they have. As explained under "Phenolics," page 64, this is probably a result of more efficient and faster operation than it is of actual physical expansion, although there is no denial that new compression presses have been installed in larger quantity than expected. At any rate, there is all sorts of evidence that compression molders are after still more business.

When asked at what capacity they had operated in 1947—defining capacity as a 20-hour day, 5-day week—molders in general reported that:

- 14% operated at 100% or more of capacity
- 21% operated at from 80 to 99% of capacity

Table V.—Types of Products Molded, with Percentage of Molders Working in Each^a

Type of product	Percentage of industry	Percentage devoting 25% or more of their capacity to named category
Automotive	41% (or 185)	25% (or 48)
Home appliances, such as vacuum cleaners, washing machines, stoves, toasters, irons, etc.	45% (or 203)	36% (or 73)
Electrical components such as wiring devices, junctions, circuit breakers, etc.	54% (or 233)	51% (or 119)
Medical, scientific, and precision instrument parts	35% (or 158)	7% (or 11)
Wearing apparel such as buttons or jewelry	12% (or 54)	40% (or 22)
Toys, dolls, games, and sporting goods	44% (or 198)	39% (or 77)
Refrigerators	26% (or 117)	15% (or 18)
Communications such as radio, television, recorders, phones, etc.	51% (or 230)	27% (or 62)
Hardware for housing, such as bathroom fixtures, door knobs, etc.	29% (or 131)	14% (or 18)
Kitchen utensils and gadgets	39% (or 176)	33% (or 58)
Packaging, such as closures, boxes, display holders, etc.	31% (or 140)	30% (or 42)
Other ^b	40%	

^a With the exception of the electrical components category, 40% of the molders devote 50% or more of their production to a specific category, as listed.

^b Includes industrial equipment, business machines, dinnerware, advertising novelties and premiums, photographic equipment, farm implements, religious figurines, drug and needle trade items, fishing equipment, cocktail specialties, etc.

45% operated at from 50 to 79% of capacity
20% operated at less than 50% of capacity.

After weighing the figures and allowing greatest weight for those with greatest volume, we estimate that the molding industry operated at approximately 65% of capacity in 1947. Those who operated as injection molders only showed the highest capacity operation with a mean average of around 70%, and there were over a quarter of them who stated that they operated at 90% or more of capacity in 1947. Those operating as both injection and compression molders showed

Table VI.—Estimated Molding and Extrusion Material Production in 1946 and 1947, Exclusive of Vinyl^a

	1946	1947
Cellulose acetate and cellulose acetate butyrate	83,000,000	60,000,000
Phenolic	140,000,000	196,000,000
Urea and melamine	35,000,000	35,000,000
Polystyrene	67,000,000	92,000,000
Miscellaneous ^b	50,000,000	60,000,000
Total lb.	375,000,000	443,000,000

^a Includes filler. ^b Includes acrylic and miscellaneous molding materials.

around one fifth of their numbers at the near capacity mark, but most of them were in the 60 to 80% of capacity class. It seems from our figures that lack of material may have held back the compression molders more than lack of customers held back the injection molders. It is also evident that injection molders must have had large inventories of molding material which they worked off during the slump. Another interesting element is the drop in dollar volume suffered by the plastics molders in 1947. According to S.P.I. reports, the dollar volume in the molding business has fluctuated between \$170,000,000 and \$140,000,000 in the last four years. 1947 was not one of the better years.

In reaching the above percentages, we based the results on our survey returns which indicated that 36% of all molders do injection only, 33% do both injection and compression, and 21% do compression only. The remaining 10% are extruders.

It is believed that there are about 500 major molders and extruders in the country. There are at least 250 more companies who are molding material of some sort or another, some of whom have not yet become firmly es-

Report from the S.P.I.

by GEORGE H. CLARK*



GEORGE H. CLARK

IN THE past year the plastics industry has continued to grow in plant capacity and in volume of output. This growth and expansion is in addition to the expansion in the industry as the result of war-time activity. As far as we can see into the future, expansion will continue. The tried and proved

uses of plastic materials expand more rapidly than the capacity of the industry to produce. This expansion goes on in spite of misapplications and the examples of over-promotion which continue to plague the industry.

That portion of the industry's products which go into component parts—the portion of the industry's output which is sold to other manufacturers—is in a very healthy state.

The quality of that portion of the industry's output which reaches the ultimate user by way of the retail counter continues to improve. Buyers for retail outlets are becoming better informed on the industry's products. Producing units in the industry continue to feel a greater responsibility for the products that they

offer. Buyers for retail outlets are daily demanding more in the way of informative labeling than has been the case in the past, and the industry is responding by selling a larger portion of its output under the informative labeling plan whereby both the advantages and limitations of the product are brought to the consumer's attention.

The educational programs which have been promoted by the industry and its associations in the past, and continue to be in force, are having their effect on the individual buyer. It would be folly to say that all of the producing units in the industry are taking their responsibilities to the industry and its customers seriously. There will always be elements in the industry who will over-promote their wares, and who will, either through ignorance or intent, offer materials which will not serve the user efficiently and which will react unfavorably on the industry's reputation.

If the plastics industry is to take over the sales volume that can be channeled in its direction, the highest possible quality of product must be maintained. The industry is backed by the research and development efforts of the largest companies now in existence in the chemical field. Research sponsored by the industry is currently going on in many universities.

Misapplication of the industry's products should not occur as a result of ignorance. Those who manufacture plastic materials and sell them to fabricators must show an increasing interest in the end use of their

* President of S.P.I., and vice-president, Formica Insulation Co.

established but mostly they are companies who mold component parts for use in their own products. Of the 500 we believe about 10%, or 50, are extruders. That would leave approximately 162 exclusive injection molders, 95 compression molders, and 148 who do both; but the volume of business done by the last group is probably larger than that of any of the others.

Other facts gleaned by the survey are:

Percentage of custom and proprietary molders in the industry—

Custom.....35%
 Proprietary..... 8%
 Both custom and proprietary.....57%
 Of the custom molders, 31% expect to add proprietary items, 54% do not plan to do so, and 15% did not specify.

Equipment changes

Added equipment in 1947.....76%
 Did not add equipment.....24%
 Scrapped some equipment since the war.....
13% said yes; the others said no.

Expecting to scrap some equipment.....
11% said yes; the others said no.
 Many said they were modernizing old equipment.

Did volume increase in 1947 over 1946?

Both injection and compression molders	{	75% said yes in poundage volume
		77% said yes in dollar volume
Injection molders only	{	54% said yes in poundage volume
		55% said yes in dollar volume
Compression molders only	{	60% said yes in poundage volume
		60% said yes in dollar volume

A Guess on 1948 Volume

Compression molders only—81% of those queried hazarded a guess that 1948 would be equal to or better than 1947. The remaining 19% wouldn't guess. Guesses ran from 10 to 200% better, but

products if the industry's customers are to be protected. No fabricator should operate without a complete technical knowledge of the materials that go into his products.

Through the technical activities of committees of the Society of the Plastics Industry, the Plastic Materials Manufacturers Association, the Laminated Products Section of the National Electrical Manufacturers Association, and the Society of Plastics Engineers, the plastics industry has perhaps the greatest array of research and engineering talent available to any industry today. If management in the industry supports this technical activity up to the hilt, the industry should move rapidly in the direction of standardization of its products.

The Society of the Plastics Industry, and the other groups mentioned above, continues to be one of the most active trade association groups operating in any industry. All of the trade association functions are being carried out by way of committees. Satisfactory progress has been made in 1947, and it is felt that our committee setup will be even more efficient for the 1948 period. Many suggestions reach the Board of Directors from individual members, from groups of members, and from our committees. After careful study, the Board has not been able to put all of these suggestions that appear to have merit into practice because many of them depend on the possibility of policing the Society's membership. Much of the progress in the way of solution of the industry's problems is accomplished by passing along all available information to the membership with suggestions as to the best policy to be adopted.

Even though the budgets of the associations operating within the plastics industry are average in size by comparison with other industries, the total expenditure is very small compared to the sums that are being spent by the industry in sales promotion, advertising, and public relations. It is not likely that the trade associations in the industry will ever find themselves in a position to take over even a small portion of this burden even if the industry felt a necessity for such a program. The function of a trade association is to deal with the agencies of Government who are interested in the industry's output, to act for the industry when Government activities threaten its freedom, to deal with other trade associations and customer groups interested in the industry's products, to bring together the research and engineering personnel of the industry for establishment of standards, to spread knowledge of the industry's products, and, finally, to bring together all the personnel of the industry for discussions of industry problems. We think S.P.I. and the other societies within the industry are operating with outstanding efficiency.

Negotiations are going on between the different association groups in the industry that have as their objective changes in organization which will promote an even better use of all of the research and technical personnel interested in plastics, plus a more extensive sectional coverage. It is my belief that the industry would like to feel that everyone associated with it, even down to the last machine operator, should have a part in its association activities. The industry is young. Let's get our associations efficiently organized before tradition closes the door.

Engineering trends

by T. E. ORR*



T. E. ORR

THE SUDDEN change from a sellers' market to a buyers' market in 1947 has placed a heavy burden on plastics engineering. Profits result from good markets which are served properly by economical manufacturing methods. Plastics engineers bear the burden of design-

ing suitable materials and products for the markets and designing production methods that will produce the parts at low cost with a minimum of hazard. The serious market conditions for plastics in 1947 brought the full burden to the engineers and a most remarkable job was done to meet these problems.

Products have been improved by better material selection and improved quality control of manufacturing processes. Increasing labor cost and material prices have been cushioned by improved mold design and manufacturing techniques. In the thermoplastic field, product uniformity has been improved by means of better temperature control units for molds and improved drying methods for raw materials. Thermosetting molding cycles have been reduced by the use of advanced automatic mold design and high-speed press operation with full "push button" control. Steam pre-

* National president of S.P.E.

heating has been a cost reduction factor which has been used considerably during 1947.

S.P.E. has considerably expanded its field of operation during 1947. New sections were formed in 12 communities. Technical activities moved into important action with a program of consumer specification which will be of substantial value to the industry. The importance of technical education in plastics has been recognized by S.P.E. and an outstanding group of educators and engineers, under the leadership of Prof. Louis H. Rahm of Princeton University, has undertaken the job of developing suitable plastics curricula for our educational institutions.

The S.P.E. Annual Technical Meeting in 1947 presented a series of technical papers which were outstanding and of national interest. This activity is considered of major importance; continued effort will be expended to improve the quantity and quality of technical papers on plastics. The monthly and annual technical meetings of S.P.E. are contributing greatly to the improved understanding and use of plastics. These activities are also designed to improve the professional status of plastics engineers and the engineering ethics of the industry.

S.P.E. will devote its energy in 1948 to improved local meetings, progress in the consumer-specification field, and improved dissemination of our accumulated technical knowledge. Membership requirements will be tightened and the status of our present members will be re-evaluated so that the membership status of S.P.E. members will be uniform throughout the country.

the majority seem willing to settle for 20% better. Injection molders only—64% think business will be better in 1948. A big majority of this group say from 20 to 50% better. 15% say business in 1948 will be no better or worse. The others won't say. Molders who do both injection and compression molding—55% say business will be from 10 to 100% better in 1948. They favor 25% as about right. 8% say business will be the same or worse. 37% say, "What a question!"

Table V, p. 75, is a compilation of the work done in various molding plants, showing the percentage breakdown by plants. Thus, the first line shows that 41% of all molders work on automotive parts. Of these molders, 25% devote a quarter or more of their capacity to that classification. Based on a total of 450 major custom and proprietary molders in the country,

there would be 185 of them molding automotive parts and 48 devoting 25% or more of their capacity to that type of product.

Machines

THE tempo for increased capacity via the new machine route dropped off somewhat in 1947, but it was still surprisingly high, and machine sales turned upward in the closing months of the year. In one week of November, for example, we learned of 15 sales.

Totals for the year in the United States are estimated at 420 compression presses; 350 injection presses; and 180 extruders for plastics. There were also at least 65 injection presses exported.

There was some scrapping of old presses—we know of about 75 of both types, but there may have been more,

Table VII.—Machines in the Plastics Molding and Extrusion Industry

Type	1941	1945	1946	1947
Injection	1000	1,720	3,275	3,625
Compression	8000	12,065	12,975	13,390
Extrusion	...	850	1,150	1,327

although most molders claim they modernize their old presses rather than scrap them. It is also known that there are several hundred "built to order" or "made in the plant" injection presses operating in the industry, which are not included in these figures.

Based on machines sold in the U. S. this year and omitting the "made in the plant" presses, the record of machines in the industry is estimated in Table VII.

Laminators

HIGH pressure laminators used up 40,000,000 lb. of phenolic laminating resin and several million lb. of melamine in 1947. Since laminating varnish is about 60% solids, this means that the industry consumed a little over 60,000,000 lb. of laminating varnish last year.

For statistical purposes, the industry usually figures that for every lb. of varnish consumed, a finished lb. of laminate is produced. Consequently, it appears that

the industry produced between 60,000,000 and 65,000,000 lb. of laminate in 1947. During the war, production went as high as 80,000,000 lb.; laminates are particularly useful for electrical applications in war-time, and Government purchases were high—even in peace-time, they are said to be 15% of total production.

Even though 1947 production failed to come up to war-time levels by a good margin, it was far ahead of pre-war days when the high year was 25,000,000 lb.

The laminators have also taken over a great part of the finishing of sheets, rods, and tubes that once was done by their customers. It has been estimated that about 19,000,000 lb. of their total production is now finished or fabricated in the laminator's plants.

Part of the post-war production is accounted for by decorative laminates used for doors, window frames, table tops, and similar applications. In 1947 these laminates became increasingly popular for use as decorative paneling on steamships, in restaurant-soda fountains, in homes, and particularly in railway cars. It is estimated that decorative laminate production accounted for about 11,000,000 lb. of the 1947-total.

The laminating industry has been going through a considerable scramble since the war when, at one time, there were some 90 laminators in the field. Today the industry has been cut back to pre-war proportions with old-time high pressure laminators solidly entrenched.

Resin statistics from tariff commission

THE 1946 Tariff Commission statistics printed herewith show a total production of synthetic resins and plastics (exclusive of cellulose) of 994,000,000 lb., or 22% greater than in 1945. The plastics industry is mainly concerned with only some 600,000,000 lb., since 379,834,000 lb. were for protective coatings.

The miscellaneous quotation of 207,053,000 lb. in Table VIII is a figure which cannot be broken down, and how much of it actually goes into what are generally considered plastics products is a moot question.

The complexities involved and the difficulties in interpreting the figures are shown by the protective coating

Table VIII.—End Use Data for Resinous Plastic Materials, 1946 (Quantities and Values Are Based on Net Resin Content Only)

End use	Production		Sales				
	1000 lb.	%	Quantity		Value		Unit value \$ per lb.
			1000 lb.	%	\$1000	%	
For protective coatings	379,834	38.2	336,268	36.0	84,226	25.1	0.25
For molding and casting	245,033	24.6	237,790	25.4	88,993	26.5	0.37
For laminating	36,763	3.7	35,479	3.8	10,238	3.1	0.29
For adhesives	78,012	7.9	78,074	8.4	18,052	5.4	0.23
For treatment of textiles, paper, and leather	46,321	4.7	42,016	4.5	14,519	4.3	0.35
For ion exchange	1,261	0.1	1,225	0.1	631	0.2	0.52
For miscellaneous uses ^a	207,053	20.8	203,359	21.8	118,626	35.4	0.58
TOTAL	994,277	100.0	934,211	100.0	335,285	100.0	0.36

^a Includes plastics materials for glazing, sheeting, and film.

Table IX.—United States Production and Sales of Plastics, 1946 (In Terms of Net Resin Content^a)

Class and product	Production	Sales ^b		
		Quantity	Value	Unit value
	1000 lb.	1000 lb.	\$1000	\$ per lb.
Rosin esters, total	101,941	102,321	16,978	0.17
Rosin esters, modified: ^c	35,372	35,768	7,141	0.20
Rosin esters, unmodified, total	66,569	66,553	9,837	0.15
Rosin (abietic acid), glycerol	41,297	46,344	6,892	0.15
All other unmodified rosin esters ^d	25,272	20,209	2,945	0.15
Tar acid resins, except rosin ester modified, total	186,714	181,772	54,704	0.30
Unmodified, total	182,831	177,876	53,604	0.30
Phenolic resins except mixed phenolics, total	129,812	128,303	40,406	0.31
Phenol-formaldehyde, total	114,758	113,103	35,908	0.32
For molding and casting	61,182	60,403	22,457	0.37
For laminating	15,360	15,177	3,629	0.24
For protective coatings	4,406	4,336	1,403	0.32
For adhesives	19,843	19,556	4,521	0.23
For ion exchange, and for treatment of textiles, paper, and leather	1,642	1,642	766	0.47
For miscellaneous uses	12,325	11,989	3,132	0.26
All other unmodified phenolic resins except mixed phenolics, total ^e	15,054	15,200	4,498	0.30
For protective coating	6,574	6,673	2,221	0.33
For other uses	8,480	8,527	2,277	0.27
Mixed phenolic resins, total ^f	53,019	49,573	13,198	0.27
For protective coatings	12,951	10,025	1,838	0.18
For adhesives and laminating	9,232	9	9	9
For other uses	30,836	39,548	11,360	0.29
Modified total ^g	3,883	3,896	1,100	0.28
For protective coatings	709	727	190	0.26
For adhesives and laminating	555	539	134	0.25
For other uses	2,619	2,630	776	0.30
Alkyd resins, oil and solid types ^h	241,390	202,296	53,524	0.26
Modified by rosin esters, total ⁱ	67,415	66,733	14,810	0.22
Phthalic type: For protective coatings, total	20,547	18,971	5,694	0.30
Phthalic anhydride-glycerol-rosin ester	10,962	10,230	2,872	0.28
Phthalic anhydride-glycerol-phenol-formaldehyde-rosin ester	7,302	6,992	2,343	0.34
Phthalic anhydride-maleic anhydride-glycerol-rosin ester	171	50	16	0.32
All other rosin ester modified phthalic alkyd resins: For protective coatings ^j	2,112	1,699	463	0.27
Polybasic acid type except phthalic	46,868	47,762	9,116	0.19
Maleic anhydride polyesters-rosin ester, total	44,396	45,209	8,568	0.19
Maleic anhydride polyesters-rosin ester: For protective coatings	9,459	7,190	1,817	0.25
Maleic anhydride-glycerol-rosin ester	7,883	8,546	1,528	0.18
Maleic anhydride polyesters-rosin ester (other than glycerol)	27,054	29,473	5,223	0.18
Fumaric acid polyesters-rosin ester, total	1,562	1,623	335	0.21
Fumaric acid polyesters-rosin ester: For protective coatings	306	329	87	0.26

^a Net resin content excludes all fillers, unreacted modifiers (such as ester gum when not chemically combined), dyes, and plasticizers. Additives such as rosin (80% or more abietic acid) which are chemically combined with other resin-forming components are included in the data.

^b Sales of resins for protective coatings include certain intraplant transfers as well as the usual interplant transfers, i.e., transfers from one establishment or the department of the company synthesizing resins for surface coatings to the establishment or department of the same company which uses them in the formulation of protective coatings.

^c Includes rosin esters, modified by substituted and unsubstituted phenolic resins or fatty acids. Phenolic resins modified with rosin (abietic acid) are included with tar acid resins. Other modified rosin ester resins are included with the alkyd resins.

^d Includes rosin (abietic acid) esters of pentaerythritol, ethylene glycol, methanol, mannitol, sorbitol, and mixed alcohols.

^e Includes formaldehyde and furfural condensation resins of *p*-tert-amylphenol, *p*-tert-butylphenol, resorcinol, bisphenylphenol, cresol, cyclohexylphenol, and xylenol.

^f Includes cashew-nut shell oil type, cresylic acid, and mixtures of cresols, phenols, xylenols, *p*-tert-amylphenol, *p*-tert-butylphenol, bisphenylphenol, and resorcinol.

^g Included with mixed phenolic resins for other uses.

^h Includes phenolic resins modified with sulfonic acid, coumarone-indene, rosin, vinyl resins, and vegetable oils.

ⁱ Includes anhydride-alcohol-oil chemically combined.

^j Alkyd resins modified by rosin are classified with rosin ester modified resins because of radical interchange.

^k Includes all rosin ester modified phthalic type alkyd resins, not separately classified, including those which are also modified by fatty or dibasic acids.

figure given as 379,834,000 lb. in Table VIII; the reader will find only a little over 235,000,000 lb. actually labeled for protective coatings in the detailed breakdowns in Table IX. This difference may be partially due to a ruling which forbids the Tariff Commission to expose a company's production figure when there are only one or two companies producing a given chemical and a reporting system that must needs be

complicated and sometimes obscure due to the very nature of the chemical industry. For example, rosin esters are given in Table IX as 101,941,000 lb. without indication of their end use, although it is known that practically the entire production goes into protective coatings. Alkyd resins, too, are used largely for protective coatings as are also portions of the urea, vinyl, and styrene resins which are listed under "other uses"

Table IX.—(Continued)

Class and product	Production	Sales ^a		
		Quantity	Value	Unit value
	1000 lb.	1000 lb.	\$1000	\$ Per lb.
Fumaric acid polyesters-rosin ester	1,256	1,294	248	0.19
All other rosin modified alkyd resins except phthalic ^j	910	930	213	0.23
Unmodified by rosin esters, total	173,975	135,563	38,714	0.29
Phthalic type, total	167,368	129,268	36,267	0.28
For protective coatings, total	164,378	126,336	35,394	0.28
Phthalic anhydride-glycerol	111,306	82,975	23,373	0.28
Phthalic anhydride-pentaerythritol	18,271	9,529	2,561	0.27
Phthalic anhydride-glycerol-pentaerythritol	2,178	2,009	505	0.25
Phthalic anhydride-glycol-pentaerythritol	1,314	1,263	387	0.31
Phthalic anhydride-maleic anhydride-glycerol	23,312	22,740	6,268	0.28
Phthalic anhydride-maleic anhydride polyesters, other	4,064	4,202	1,222	0.29
Phthalic anhydride-glycerol-phenol-formaldehyde	283	"	"	"
All other phthalic type alkyd resins, unmodified by rosin esters: For protective coatings ⁿ	3,650	3,618	1,078	0.30
For other uses ^o	2,990	2,932	873	0.30
Polybasic acid type except phthalic type, total	6,607	6,295	2,447	0.39
Maleic anhydride polyesters, total	2,210	1,826	694	0.38
For protective coatings	520	351	108	0.31
For other uses	1,690	1,475	586	0.40
All other polybasic acid type except phthalic ^p	4,397	4,469	1,753	0.39
Urea and melamine resins, total ^q	91,444	90,461	27,004	0.30
For treatment of textiles, paper, and leather	13,897	14,159	3,414	0.24
For adhesives	37,476	38,872	6,783	0.17
For other uses	40,071	37,430	16,857	0.45
Vinyl resins, total ^r	155,609	147,713	57,730	0.39
For molding and casting	49,520	48,920	17,019	0.35
For laminating and adhesives	16,868	14,901	6,932	0.47
For glazing sheeting, and film	32,385	31,511	13,016	0.41
For treatment of textiles, paper, and leather	25,117	21,169	7,932	0.37
For other uses	31,719	31,212	12,831	0.41
Styrene resins:				
Polystyrene-maleic anhydride condensation resins	113	"	"	"
Polystyrene-pentaerythritol and other styrene condensation resins	"	"	"	"
Polystyrene polymerization resins	73,054	68,216	18,785	0.28
All other resins, total ^t	144,012	141,432	106,560	0.75
For protective coatings	13,067	11,793	2,257	0.19
For molding and casting	18,561	17,880	13,496	0.75
For treatment of textiles, paper, and leather	2,448	2,383	2,268	0.95
For other uses	109,936	109,376	88,539	0.81
GRAND TOTAL	994,277	934,211	335,285	0.36

ⁱ Includes rosin ester modified polybasic acid esters of cyclopentadiene and acids other than fumaric, maleic and phthalic.

^m Included in all other phthalic type alkyd resins, unmodified by rosin esters, for protective coatings.

ⁿ Includes unmodified phthalic polyesters of alcohols not separately classified and phthalate polyesters modified by acids other than maleic anhydride or rosin.

^o Includes unmodified phthalate resins and those modified by acids other than rosin.

^p Includes unmodified alkyd resins of cyclopentadiene and other acids than phthalic or maleic and modifications of these resins by acids other than rosin.

^q Includes substituted urea and melamine resins.

^r Includes polyvinyl halides and copolymers, butyral, and formal and acetate, alcohol, and ethers.

^s Included in all other resins.

^t Includes rosin adducts and condensation resins such as aniline-formaldehyde, toluene-sulfonamide, polystyrene-pentaerythritol, polyamide resins (nylon), and petroleum condensation resins and polymerization resins such as coumarone-indene, polyacrylic and polymethacrylic acid ester resins, furfuryl-furfural, polyterpene, polyethylene, silicones, petroleum polymers, and other miscellaneous resins.

or which have no definite end product designated.

Furthermore, if an examiner attempts to make the detailed figures in Table IX coincide with the bulk figures in Table VIII, he will run into trouble. For example, take "molding and casting" in Table VIII at 245,033,000. The sum of the molding and casting resins detailed in Table IX is 129,263,000. This latter figure does not include polystyrene polymerization resins

given as 73,054,000, nor urea and melamine resins in "other uses" as 40,071,000, although much of the material included in these two items is for molding purposes except a comparatively small amount of melamine used for laminating. Nevertheless, if the total is added to include polystyrene and urea for "other uses," the sum of resins for molding material in Table IX still does not equal that in Table VIII. (Turn to next page)

Table X.—Comparison of Tariff Commission and Census Bureau Figures for 1946

	Tariff Comm. 1946	Census Bureau 1946		Tariff Comm. 1946	Census Bureau 1946
	lb.	lb.		lb.	lb.
Unmodified phenolic and other tar acid molding and casting- resin content only	60,403,000	.....	Polystyrene polymerization resins	68,216,000	66,769,321
Phenolic and other tar acid resins for molding only, but includ- ing approx. 50% filler	.....	140,216,443	Vinyl resins		
All phenolic and other tar acid resins for laminating and ad- hesives—resin content only	44,200,000	.....	For molding and casting—resin only	43,920,000	.....
Phenolic and other tar acid resins (dry basis)			For molding and extrusion— resin only	.....	61,852,162
For laminating	.....	27,725,335	For glazing sheeting (safety glass) and film, resin only	31,511,000	.....
For adhesives	.....	16,120,513	For sheeting and film, including safety glass, and including all filler, plasticizer, etc., which amounts to an average of around 33 1/4%	.....	52,079,495
Urea and melamine for treatment of textiles, paper, and leather —resin only	13,879,000	.....	For treatment of textiles, paper and leather—resin only	21,169,000	.....
For textile and paper—resin only	.....	13,534,368	Textile and paper coating res- ins, resin only	.....	11,673,212
For adhesives—resin only	38,872,000	40,797,108	For laminating and adhesives	14,901,000	.....
For other uses, including mold- ing, laminating, coatings, etc. —resin only	37,430,000	.....	All other, including adhesives but not protective coatings	.....	27,082,895
For other uses, including lami- nating (dry basis) but ex- cluding molding powder ^a	.....	3,900,000 ^b	For other uses, including pro- tective coatings	31,719,000	.....
			Total vinyl resin (dry basis), in- cluding protective coatings	147,713,000	.....
			Total vinyl resin, including the filler used in sheeting and film and exclusive of protective coatings	.....	152,687,764

^a Ed. note: Molding powder figures not given—thought to be about 30,000,000 lb., including filler, for the year.

^b Adjusted by editor due to gap in reporting figures caused by a company strike.

The difference cannot be accounted for by acrylics, polyethylene, nylon, etc., for they are included under "all other resins" in Table IX; so, consequently, the total of "molding and casting" resins in Table VIII must include a generous quantity of resins that are hidden in some unknown category. The reader should also bear in mind that this total is based strictly on solid resin in comparison with other molding powder figures used in the industry which frequently include plasticizers, filler, pigment, etc.

Other total figures such as those under "laminating" and "adhesives" in Table VIII bear a similar relationship to the detailed breakdowns in Table IX, but under the present system of reporting to the Tariff Commission, there seems no possible way of bettering this situation.

The dollar value in Table VIII listed at \$335,285,000 is something this magazine hesitates to use to estimate the money value of the synthetic resins industry. There are so many complicated factors involved, such as inter-company sales, and involved averages due to the great number of compounds selling at different prices in the different categories, such as phenolics and vinyls, that it would seem impossible to arrive at an accurate figure. Anyhow, the \$300,000,000 total figure is a misnomer in so far as plastics is concerned because it represents the use of synthetic resins in many things besides plastics and includes none of the sales in the cellulose branch of the industry.

One of the most interesting figures in the Tariff Commission summary is the "all other resins" totaling

144,012,000. If this figure, containing such things as the acrylics, coumarone-indene, nylon, polyethylene, silicone, and other materials, could be broken down, it would reveal some surprising facts; but the Commission is not permitted to break the figure apart because it would reveal the operations of individual companies.

Attention should be called to the difference in totals shown by these Tariff Commission reports and those published by the Bureau of the Census as published in this magazine each month. These two groups of figures are compared as closely as possible in Table X, sales figures being used for Tariff Commission and consumption figures for Census.

If any man has the patience and knowledge to adjust these two sets of figures, he is welcome to try. There are as many different views and opinions on the variances as there are experts to ask. The Census Bureau makes no claim to infallibility but has been revising and improving its reporting system to make it as accurate as humanly possible. The Tariff Commission feels that its figures are reasonably accurate and asserts that a yearly report has certain refinements which cannot be obtained when the reporting is done on a monthly basis, as in the case of the Census Bureau. The different sets of figures are presented here with the knowledge that they are sometimes inconclusive but as the best available for those interested in studying plastics statistics and to illustrate the difficulties confronting any person who attempts to chart production or consumption figures in the industry.

Foreign trade

Table XI.—U. S. Exports of Specified Plastics Materials

	<i>lb. in</i> 1937	<i>lb. in</i> 1939
Synthetic gums and resins	7,000,000	11,897,220
Pyroxylin scrap and film scrap	3,473,281	1,446,967
Pyroxylin plastic film support	3,689,468	3,602,430
Pyroxylin sheets, rods, tubes	613,004	259,251
Cellulose acetate sheets, rods, and tubes	887,321	1,167,510
Cellulose acetate film support	.....	1,045,613
Nitro and aceto cellulose solutions	1,129,249	839,762
TOTAL	16,792,323	20,258,773

Source: Bureau of Census, U. S. Dept. of Agriculture

Table XII.—Total Exports for 1946

	<i>lb.</i>
Alkyds	6,944,900
Tar acid resins	17,208,964
Urea	6,288,517
Other synthetics	9,139,883
Polymers of styrene and vinyls	11,205,786
Sheets, rods, and tubes, laminated	3,081,134
Cellulose nitrate, including scrap, film support, sheets, rods, tubes	7,441,458
Cellulose acetate, including film support (1,780,651) sheets, rods, and tubes (1,111,364) and molding material (7,545,248)	10,437,263
TOTAL	71,747,905

Table XIII.—Comparison of Exports* for First Nine Months of 1946† and 1947‡

	<i>January through</i> <i>September</i>	
	<i>1946—lb.</i>	<i>1947—lb.</i>
Alkyd resins	4,710,000	11,816,787
Tar acid resins (powder, flake, or liquid)	11,848,000	19,556,575
Urea resins (powder, flake, or liquid)	4,538,000	6,729,345
Synthetic resins (powder, flake, or liquid—not otherwise specified)	5,712,000	11,243,874
Sheets, plates, rods, tubes, and other unfinished forms—		
Laminated	1,000,000	1,680,239
Not laminated	1,005,000	1,658,557
Cellulose nitrate—		
Scrap and film scrap	1,036,000	2,185,191
Film support and base	3,106,000	4,486,239
Sheets, rods, tubes, etc.	1,083,000	1,473,730
Cellulose acetate—		
Molding compounds	4,199,000	14,490,347
Sheets, rods, tubes, etc.	727,000	1,548,944
Film support	1,189,000	1,625,240
Polymers of styrene, vinyl acetate, etc.	5,492,000	28,739,035
TOTAL for nine months	45,645,000	107,234,103

* Source: Compiled in the Chemical and Drug Div. of the Dept. of Commerce from data supplied by the Bureau of the Census.

† Money value for first nine months of 1946 was \$19,101,000.

‡ Money value for first nine months of 1947 was \$45,628,875.

A FEW statistics on plastics exports and imports are given here for the first time in this magazine because of their growing importance. Note that the total for raw materials since 1937, a good peacetime year for most exports, has grown from 17,000,000 lb. to almost 72,000,000 lb. in 1946, with a possible doubling of that figure in 1947, largely due to the increased exports of cellulose acetate molding material, polystyrene, and the vinyls. In September alone, the latest month for which figures are available, there were 906,347 lb. of acetate molding powder and 2,997,035 lb. of polystyrene and vinyl shipped out of the country despite the barriers of dollar shortages, foreign import licenses, bans, quotas, and other restrictions. Whether or not these large exports continue into 1948 depends largely on what the United States Government does about handling supplies to Europe. Canadian and Latin American exports, which account for a good portion of this figure, may also be affected by the dollar shortage.

The table on imports and exports of finished plastics commodities is far from conclusive because plastics products are seldom listed as such. It is given here to call attention to the need for more complete statistics on finished plastics products when tariff proposals are under consideration.

Table XIV.—Selected Manufactures of Plastics Materials: United States Exports and Imports, 1946*

<i>Article</i>	<i>Exports</i>	<i>Imports</i>
Articles of synthetic resins, not elsewhere specified	\$11,231,267	\$ 67,408
Articles of cellulose compounds, not elsewhere specified	4,214,482	169,422
Articles of casein compounds, not elsewhere specified	"	6,787
Articles of other plastics materials, not elsewhere specified	"	"
Phonograph records	6,803	764,395
Mechanical pencils	5,395	"
Fountain or stylographic pens	61,445	"
Buttons	5,514,169 ^b	29,164 ^c
Tooth and other toilet brushes and parts	"	3,028
Combs	"	21,305
Dolls and toys and parts	"	210
Table tennis balls	"	77,423
Umbrella, cane, etc., handles	"	1,198
Beads of synthetic resins	"	238
TOTALS	\$21,033,556	\$1,140,578

* The above table includes only those commodities either specifically mentioned by component plastics material or whose production is known to be only of plastics composition—such as table tennis balls and phonograph records. A great many articles are enumerated in official statistics without reference to component material, and it is impossible to include such data here.

^a Not separately classified.

^b Of cellulose compounds.

^c Of casein. Source: Official statistics of the U. S. Dept. of Commerce.

THE sins which thrived in the boom atmosphere in plastics in 1946—sins of poor design, marginal application, and negative merchandising—had their repercussions in the Spring of 1947. Particularly in the case of the thermoplastics, material consumption dropped and idle injection machines were seen for the first time in several years.

Early in 1947, department and chain stores and wholesalers began the rapid liquidation of stocks of many plastic items; by June the markets had been cleared of a lot of poor products and useless gimcracks, production of which had been encouraged during 1946 by distributors in an attempt to fill their empty shelves.

The "buyers' market" in plastics was a challenge to the industry and to individual molders, processors, and users of plastics.

It caused, first, a new approach to product design in plastics, since there were obviously no market hopes for misapplications.

It caused, second, a realization of responsibility on the part of material manufacturers for the development and extension of markets for their customers.

It caused, third, a great many molders who were formerly engaged exclusively in custom business to develop proprietary products, the sale of which they could themselves control.

It caused, fourth, a new approach to merchandising by these proprietary molders, either by independent action or else by cooperation with the material manufacturers.

It caused, fifth, an awareness of the importance of brand-name merchandising in this industry which has always been stymied in merchandising and public relations by complicated and lengthy terminology.

It caused, sixth, recognition by the industry of the new importance of merchandising—recognition which was evidenced by the theme of the 1947 Plastics Exposition and Annual Conference of the Society of the Plastics Industry held in Chicago in May.

Those material manufacturers with informative labeling programs strengthened their functions by establishing independent tests for new applications, by policing the use of their labels and trade marks by customers, and by using the selling power of the trade mark beyond the molder to the consumer. At least one material supplier deliberately stepped out to secure distribution of proprietary products for its molder customers through the use of direct mail and bulletins. Several material manufacturers entered the consumer advertising field on a national basis while maintaining their industrial campaigns. This trend will inevitably continue in 1948, according to reports from the companies concerned.

Along with designing and making better products, the proprietary molders, processors, and fabricators,

about the middle of last year, began to develop their own merchandising formulas. Generally, their approach was through urban channels of mass distribution—chain stores and department stores—with wholesale outlets to independent retailers coming later.

In order to provide our readers with a quick and reasonably comprehensive glance at this type of merchandising application, MODERN PLASTICS contacted buyers in three major department stores, five chain stores, and two mail order houses in New York and Chicago, and asked their opinions as to which lines of proprietary plastics received the best merchandising support of their makers in 1947. Naturally, the buyers' identities may not be published. A total of more than two dozen lines of housewares, toys, stationery, apparel, and gift items were listed by these people in the field, as well as three plastic packages.

Ten of these received more than one mention. These 10 are illustrated and described on the following five pages. Our question was simply "What plastic products have been most effectively merchandised by their makers in 1947?" It may be significant that none of the 10 lines listed have been dependent in their promotion on material brand names.

As in the past, the industry through its official bodies has come no nearer the establishment of any coordinated program of informative labeling in 1947. How-

New emphasis on

ever, through constant study and individual comparing of notes, there has evolved a sound pattern which is quite apparent in the examples which are pictured herewith.

A study of the merchandising elements used in each of the accompanying illustrations will emphasize the following points:

1. The market survey is being widely used to pre-determine product acceptance.
2. Use tests are now the basis of product design—not ease of manufacture.
3. In successful cases there is insistence both on price as a competitive factor and on functional quality, and less inclination to copy a previous success and more attempts to originate.
4. Merchandising programs are being adjusted to the type of outlet and to the range into which the product fits.
5. Instructional material for store sales personnel is being provided. Demonstrations are frequently used in store promotions.

Four-gage calendered unsupported vinyl chloride film, pigmented and printed, was offered as "plastic fabric" last year by Plastron, Inc., New York, and retail sales by the yard have been phenomenal, largely because of the educational aids offered to prospective users, who were given every possible assistance and instruction in the use of the versatile fabric in many home applications.

A thorough education of salesmen on the properties and qualities of the material was coupled with an extensive promotion program. This embraced tests by independent laboratories, labels, color ads in metropolitan week-end papers, publicity in magazines and needlecraft supplements, a well-written booklet on sewing Plastron, displays for store counters, sewing classes, and a tie-up with McCall Pattern Co. on sewing patterns.

Special attention was paid to training sales girls in the stores where the product was sold; when special promotion efforts were made, the girls were given costume-jewelry replicas of the sea horse trademark. The linking of all these sales elements has proved successful.

You, Too, Can Sew Plastics



Plastic products which were most effectively merchandised in 1947

merchandising

Women's decorative belts, selling at very low prices, are not generally put up in packages but are displayed in wide color, grain, style, and size variety on counters and racks. Mass groupings in variety chain stores, in apparel shops, and in ready-to-wear sections of department stores are usually given only price tags as their sole selling support and sales are dependent upon customer preference.

When Industrial Synthetics Corp., Garwood, N. J., entered the field, distributing through Beacon Supply Co., Inc., the whole merchandising plan was geared to the "Elastron" label. The blue and white hexagon of the label carries the size of the belt and the name of the material on the front and five short statements of properties and cleaning directions on the back. The trademark is electronically molded into the belts.

For buyers, the company issues a full-color loose-leaf illustrated catalog folder which precedes or follows salesmen. Merchandising copy is used in a few large retailing papers.

Label + Price + Quality



Eggs Are Expensive



In variety chain stores the Alladin Egg-Pak has been a tremendous seller this year. Coming on sale at a time when eggs were moving up to the dollar-a-dozen mark, it offered safe storage, a neat refrigerator package in color, and enough transparency to permit the housewife to check on the egg supply.

The individual egg trays in each size (4 eggs by 3 and 6 by 2) combine end-to-end and face-to-face to form a box. These boxes, in turn, are designed to stack—which is the answer to mass display on counters. Display alone is credited with the sale because, although the company and product name are molded into the trays, no labelling or set-up backgrounds are used.

Alladin Plastics, Inc., Los Angeles, Calif., and Summit, N. J., used a full-color single advertising sheet to promote each size of Egg-Pak to store buyers; these sheets, in turn, became counter display material when required, since they carried informative selling copy.

The company specializes in chain-store merchandise and uses the color catalog technique on all lines. It also carefully analyzes markets for each proposed product from the angles of style, color, price—and timing.

Doll with a News Idea



When Chester Gould's comic-strip characters, B.O. Plenty and his wife, nee Gravel Gertie, produced their beautiful baby, Sparkle Plenty, a doll of the same name was offered to sentimental America. Ideal Novelty and Toy Co. produced the doll (which has a strong plastic head) by adding long blonde hair to one of its better dolls. At Gimbel's, New York City, 10,000 were sold in the first five days after introduction. Now, six months later, the doll is still selling!

Ideal built this market by packaging Sparkle Plenty in a brilliantly colored box that featured the comic strip, by encouraging retail advertising and special display through exclusive deals, and by publicity on a national basis.

Chester Gould has 26,000,000 readers for his Dick Tracy comic strip. The tie-in was a natural. The "scoop" effect was maintained over a long period of time in the merchandising of the doll; streamers, newspaper mats, circulars, display helps, and copious publicity were used to support the promotion program.

One of the most spectacular successes in plastics product merchandising is being done by Tupper Corp., Farnumville, Mass., on its polyethylene refrigerator bowls and covers, party items, tumblers, cups, etc.

First, the unique "feel" and waxy appearance of the material were supplemented by a choice of pastel shades and plain design. Next, folder, insert, and pamphlet labelling was used—again, in pastel shades—to tell the complete story of the quality and uses of each item, as well as to sell other products in the line. No mere labelling could ever do the intensive educational job thus accomplished.

Packaging is in transparent wrap with inserts. The line is displayed by itself where possible, taking the products out of competition with more vigorously colored items.

Tupper's promotions (premium items, night-club stunts featuring drinks that are "only authentic" when served in Tupper tumblers, etc.) plus thorough sales planning have paid off. In department stores demonstrations have been coupled with window and interior displays.

The Millionaire Line



Columbus Plastics Products Co., Inc., chose "Lustro-Ware" as a uniform trade name for all its proprietary bathroom fixtures. Three main elements are involved in the presentation of the line. First, there is the packaging—brilliant red boxes with the trademark repeated in an all-over design and identification of contents on one end of each box. Second, there are the displays, printed to represent bathroom wall tile and to show the fixtures exactly as they will appear in use. Selling and informative copy are used to good effect on the displays; instructions for application are specific; color range is exhibited by flat sample chips of the polystyrene. Third element is the brilliant catalog sheets and folders, most of which feature only one item in the line, and none of which features unrelated items. Throughout, emphasis is on the specific qualities of the plastic which make it adaptable to the uses to which it is put in each of the fixtures offered to the buying public.

Early in its merchandising experience Columbus found that a different type of distribution channel was needed for different outlets. Two top-notch distributors were selected, one of which sells only to chain stores while the other deals with department stores and wholesalers.

Better Bathroom Fixtures



Trading Up in Trays



Hasko trays, formed from paper-plywood sandwiches with plastic bonding and coating material, have been on the market for several years. They have become recognized as a standard line, offered in a variety of designs and in different sizes. Last year the makers, Haskelite Mfg. Corp., Grand Rapids, Mich., embarked on a design and merchandising program which has been enthusiastically accepted by retailers.

The company went into the merchandising of sets of similarly decorated glass tumblers and trays in two sizes. One design is shown herewith: a hunting scene. Either size of tray set or the tumblers may be bought separately.

An extra heavy promotion program was put behind a second Hasko deal: monogrammed buffet trays. These trays are provided without decoration to the department stores in packaged sets of four, and the stores are supplied with machines and materials for gold stamping individual buyer's initials. Thus, an individualized product can be manufactured and priced on a mass-production basis.

Hasko tray packages have window fronts and extensive information on the back. Dealers are provided with plywood display stands and with counter display boxes. Advertising in national women's magazines is extensive.

You Knead the Package



The Delrich E-Z Color Pak, first introduced by Cudahy Packing Co. in June, 1946, as a package for its oleomargarine, was rated by food merchants as the outstanding plastic food packaging job of 1947. By Federal law the product may not be sold colored, but the seller is permitted to furnish a capsule of coloring matter so that the housewife can do her own mixing and have a final product which is the color of butter.

In the E-Z Color Pak, both the margarine and gelatine color capsule are contained in a sealed bag made by Shellmar Corp., Mt. Vernon, Ohio, from a specially plasticized Vinylite film. The capsule is held inside the bag by a perforated patch of the same plastic film. The consumer allows the margarine to soften at room temperature, pinches the capsule to break it, kneads the margarine—still sealed in the bag—until the color suits her, returns the bag to its carton and allows it to harden into shape in the refrigerator. Approximately half a billion pounds of margarine were sold in 1946.

Klear-Vu Products Co., Inc., New York, has developed two separate product design elements and merchandising schemes in its lines of food and appliance covers selling through chain and department stores. The Vita-Guard line, made from Visking's polyethylene and packaged in brilliant envelopes with yellow backgrounds, is sold in chain stores; the Klear-Vu line, made from four-gage vinyl, is packaged more conservatively and sold through department stores. Both lines are quite extensive, their completeness being a great factor in selling to the retailers.

The Vita-Guard line, as a chain store proposition, depends on display and demonstration for its promotion. It is an economical buy and the groups permit nice price selection. The Klear-Vu department-store line, while using display, does not depend on it to the same extent. Available to retailers of this line are newspaper mats, a cooperative advertising plan, and special promotions. The package and advertising of both lines feature the Good Housekeeping seal of approval.

Gift packaging is provided the Klear-Vu retailers; the transparent acetate packages show up the colored items well.

Two Lines — Two Selling Jobs



When J. L. Schilling Co., New York City, well-known publishers of children's books, went into the plastic toy field last year, their first product was a 14-in. polystyrene boat powered with a dry cell operated electric motor. Simple in the extreme, the boat is a miniature of the Elco 27-ft. Sport Cruiser. It will run for 8 hr. on two standard flashlight batteries. With white hull, red super-structure, blue trim, transparent windshield, and plastic flags, it is foolproof and durable.

Schilling made its package the key to its promotion. Each boat has its individual colored cardboard cradle which fits into the bottom of the corrugated carton in which the boat is packaged; instructions to both dealer and consumer are included on the cutout protective sheet surrounding the boat in the carton. The carton is so designed that it will serve as a carrying case when taking the boat to and from the water.

Window displays in various stores demonstrate the boat going round and round in a circular pool of water.

The new Schilling train (see p. 91) is advertised in a folder which accompanies each boat; also the boat is now advertised by a folder every time a train is sold.

Small Boat — Big Seller





4-COLOR PLATE COURTESY TRIPLE "E" PRODUCTS CO.

Pencil points for every use

Indicator caps on these phenolic and urea pencil sharpeners can be adjusted for any of three types of points. The case catches graphite particles and shavings; user's hands stay clean

FIRST thought—plastics. The choice was a natural when it came to selecting material for a new pencil sharpener called Triple "E" Hold 'N Hand Pointer. Plastics offered the advantages of beauty, durability of finish, variety of true clear colors, light weight, and adaptability to design. Then, too, no tumbling, buffing, polishing, plating or painting processes were required, thereby cutting piece cost.

The result is a versatile sharpener with a smooth and well-designed blade body, case, and cover. Two models of the Pointer are being offered by Triple "E" Products Co., St. Louis, Mo. Setting the indicator cap on one type provides for a standard, a draftsman's long-lead blunt, or a long-lead sharp point. The other type has three standard blades for lasting service. The three hollow ground Swedish steel blades are easily replaced.

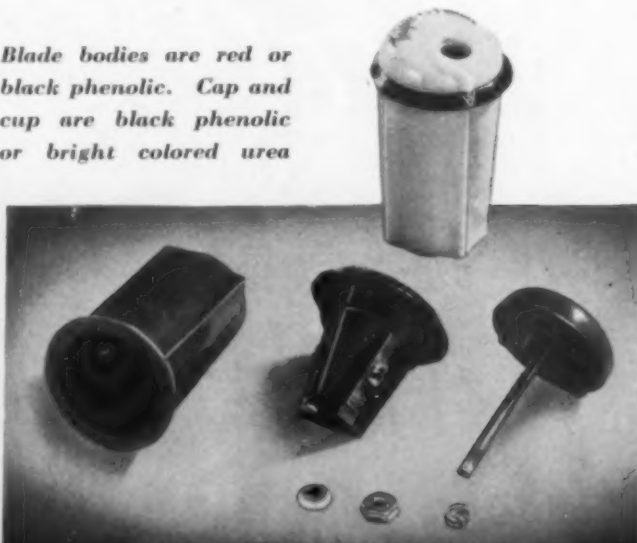
Soiled hands and smudged work are eliminated because the case catches graphite particles and wood shavings. A twist of the wrist empties it.

Bakelite and Durez general purpose phenolic was selected for the blade bodies because of its dimension-retaining properties before and after precision milling, and because of its ready machinability. These are

produced in an eight-cavity transfer mold by Kurz-Kasch, Inc., Dayton, Ohio. This company also does the compression molding of the caps and cups in red, yellow, and green Beetle and Plaskon urea formaldehyde, and in black general purpose phenolic.

Designed for general use, the Pointer is being widely distributed through a variety of stores and is also being used as a convention gift by the sales departments of business firms.

Blade bodies are red or black phenolic. Cap and cup are black phenolic or bright colored urea



Fine detail molded into toy train

New inexpensive polystyrene electric train runs on only four flashlight cells

Toy train set consists of red locomotive, blue-gray tender, two yellow passenger cars, and blue battery case, all molded of polystyrene. Train runs on aluminum track; the power is furnished by flashlight cells



TOY electric trains are usually expensive—and thus they are only given to children old enough to take care of them. This rule is broken by a new train which is molded of polystyrene and retails for well under \$15. In addition, the use of plastic makes it possible to mold in many details, such as ladders, rivet heads, and ventilators, which make the toy look more like a real train.

The realistic appearance of the toy is enhanced by the fact that the metal wheels on which the train runs are hidden by plastic false wheel trucks complete with simulated springs and journal boxes.

The J. L. Schilling Co., New York, N. Y., manufactures the set which includes a locomotive, a tender, two passenger cars, and 12 sections of aluminum track. The train operates on the power furnished by four flashlight cells, which are housed in a polystyrene box with the switch that starts, stops, or reverses the train.

Cars molded in two parts

Each of the four units in the train is molded in two parts. Four nibs in the right half of each car fit into blind holes in the left half to simplify the assembly

operation. There are also four blind holes in each car for the axles and two at the end of long projecting ribs to support the hook of the automatic coupling device. Any car can be uncoupled by touching a lever which extends through the roof of the car.

The cars are molded by Arrow Plastics Corp., Passaic, N. J. Red Loalin is used for the locomotive, blue-gray for the tender, and yellow for the passenger cars. The three dies, each of which has four cavities, were made by Beacon Engineering Co. of N. J., Inc., Passaic, N. J. The cavities were partially hobbled and details were then machined. Accuracy was important in making the dies because of the necessity of holding close tolerances so that the fine details in each car would line up when the two halves were put together.

Three-part battery case

The battery case and switch assembly consists of the case proper, a cover, and a switch lever. The three parts are molded in a six-cavity combination die by K. & C. Experimental Co., Paterson, N. J. The material is blue Loalin or Lustron. The William Kutick Mfg. Co., Paterson, N. J., made the mold.

RECENT dedication of the newly completed Odenton Health Center, in Odenton, Md., focused attention on this small community which is home and a place to work for several hundred thriving and healthy families. They are thriving because they have good jobs or own excellent farms, healthy because they live in a semi-rural area which has one of the most effective public health programs in the United States. Latest step in this program is the new clinic, particularly notable for the manner in which it came into being, and for its unusual construction in which extensive use has been made of plastic materials.

Private funds support clinic

The clinic materialized entirely from private funds, donated by public spirited citizens, and is maintained through the efforts of the people in the township who benefit by the clinic. The funds for the erection of the clinic building were made possible through the Jacob Winer Memorial Foundation. Mr. Winer was the founder of the National Store Fixtures Corp. and his sons now manage both this concern and the National Plastic Products Co. of Odenton. The land on which the building is constructed was donated by Mr. and Mrs. Murray O'Malley of Odenton.

When it was known that money for the clinic was to be made available from the foundation, a local group of citizens formed the Odenton Health Association and took upon themselves the obligation of maintaining equipment, providing required supplies, and paying operating charges.

Experience with plastics

The building was designed throughout by Mr. George J. Treuting, who has had a vast amount of experience with plastics, and who consequently used these

* Plastics Div., American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

PUBLIC HEALTH

materials whenever practicable. The National Plastic Products Co. is a producer of thick melamine laminates, and made these materials available in quantity, according to the designer's specifications.

Melamine laminates are well known as decorative panels which are very hard and mar resistant. Usually they are mounted on plywood or otherwise affixed to a rigid non-plastic material which is the actual structural



Above—The clinic nursery, where sanitary conditions are important, has all the working areas surfaced with melamine laminates



Left—The doors and walls are surfaced with melamine resin laminates. Wall panels are trimmed with extrusions of polyethylene

and PLASTICS

by PRESCOTT FULLER*

New clinic was designed to make full use of the advantages of cleanliness, durability, and appearance offered by plastics



ALL PHOTOS COURTESY AMERICAN CYANAMID CO.

Hard, glossy surfaces of melamine resin laminates look clean and are easy to keep clean. Soft colors create a restful environment, quiet patients' nerves



Window sills are surfaced with melamine resin laminates. Screens are polyvinylidene chloride



Walls and counters of storage room in the Odenton clinic are covered with a linen pattern laminate

member. However, National provides these laminates in thicknesses ranging up to $\frac{5}{8}$ in., which are self-supporting and require no backing material other than normal studding.

Extensive use of laminates

In the Odenton Health Center the entrance door is panelled on both sides with linen-pattern resin laminates. The walls in every room of the building are made of the same materials, up to a height of four feet. In the waiting room, the offices, and most of the clinical rooms, panelling is in a buff, linen finish. Occasionally, the color is relieved by a pastel green or coral, also in the linen pattern.

Desk tops, door faces, drawer walls and bottoms, even the hand rails on stairways, are surfaced with Melmac laminates. For a completely structural use, Mr. Treuting specified $\frac{5}{8}$ -in. thick laminates to be used as partitions in toilets and dressing rooms. The general effect created by the generous use of these plastic materials is excellent. Colors are soft and patterns pleasing in appearance, creating a restful environment most helpful to a distraught patient. Because the panels are hard, smooth, and glossy, they convey the impression of extreme cleanliness. Each panel is exactly like all others, and the regularity and consistency of appearance throughout the rooms of the clinic makes for a feeling of efficiency.

Maintenance costs lowered

The physical attributes of the melamine laminates are almost perfectly suited for medical use. They are chemically inert, and impart no taste or odor when used for working surfaces. They are very resistant to attack

by chemicals, weak acids, or boiling water, important factors in laboratory or X-ray developing rooms. A negligible rate of water absorption, plus hardness and ability to resist staining, make for completely sanitary conditions.

Considerable savings in maintenance are involved. The laminates are mar resistant and almost never require replacement. They need not be painted or polished. Even if splattered with ink, soap and water will restore their initial luster and appearance. Colors do not fade, and the surface will not crack or deteriorate over an indefinite period of time.

Other plastics used

In addition to the melamine resin laminates, other plastics are used in the clinic. All chairs in waiting rooms and offices are covered with Saran fabric. Here again, appearance, durability, and ease of cleaning are important factors for hospital use. Trim or edging for the joints and tops of laminated panels are made of extruded polyethylene.

The Odenton Clinic has offered inspiration to other community groups to band together in efforts to afford similar modern health facilities in their towns. It is interesting to notice that this section of Maryland, where clinics are supported by the people and staffed by the County Health Association, has communicable disease rates which rank with the lowest in the country. In the case of the Odenton Health Center, not only have the excellent principles of public health been furthered, but also attractive buildings have been made available to beautify the town, and eminently satisfactory plastic materials have been used in a way which may set a precedent for clinics and hospitals everywhere.

Personal radio features plastics

Transparent polystyrene face plate

has 101 small holes molded in it

LIGHT WEIGHT, important in a portable radio, and beauty, important in any consumer item, are achieved through the use of plastics for nine parts of the Starlet, a portable radio designed and made by Garod Radio Corp., Brooklyn, N. Y. It is 6½ in. long, 3¼ in. high, and 4⅛ in. deep. Its nine plastic parts help to keep its weight below 3½ pounds.

The front and back covers of the radio are polystyrene with an alligator grain molded into the outer surfaces. The inner surface of the front cover has a depression to accommodate the radio aerial, which is covered by a third polystyrene piece.

These three parts are molded of blue, red, green, or ivory Lustron by Gemloid Corp., Elmhurst, N. Y. The carrying handle is extruded by Gemloid, using Bakelite or Du Pont polyethylene in colors which match the polystyrene covers. The antenna lead-in is a vinyl-covered braided copper wire furnished by the Tensolite Corp., New York, N. Y.

Perhaps the most attractive part of the Starlet is the inner face of the radio, which is molded of transparent polystyrene. A decorative pattern is molded into the rear surface and a gold lacquer sprayed on. The name Garod and the frequency markings are hot-stamped on the front of the piece.

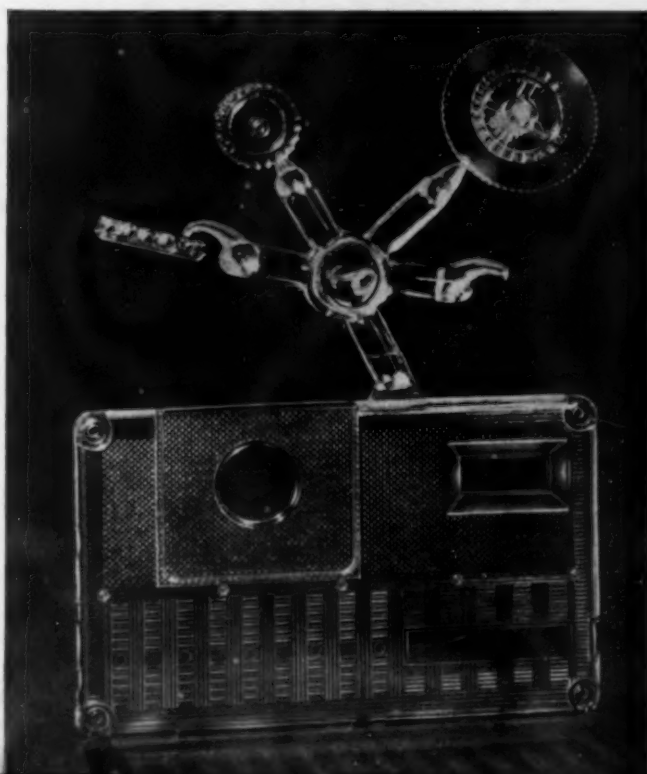
A circular hole is molded into the face plate to accommodate the tuning knob and an oblong opening for the volume control. The speaker grille is formed by molding in 99 rectangular openings, each of which is less than ⅛ in. long and 1/32 in. wide. The molder thought at first that it would be necessary to gate this part near these holes in order to get the proper flow. But a gate at the opposite side of the piece proved more satisfactory (see the sprue pictured at the right of this page).

The face plate is molded by Gemloid of transparent Lustron in a 4-cavity combination die along with the tuning knob, the volume control knob, and an antenna insulator. A fifth cavity (for a second insulator) was closed off when that part was eliminated from the final design.



Radio (top) has vinyl-covered aerial lead-in, polyethylene strap, and seven polystyrene parts

Antenna insulator, volume control and tuning knobs, and face plate are molded in one shot



Plastics Products



Twist the base of this Darnlite and a light goes on inside the two-piece polystyrene head to silhouette the part being mended. The cellulose acetate butyrate handle unscrews and can be used (with its standard pen-type battery and bulb) as a purse or pocket flashlight. Another model, the Darnegg, has a hollow handle for needle storage. Both are made by Betwil Co., 530 Gretna Green, Los Angeles 24, Calif., using white Styron and red Tenite II.

The application of plastics and a little imagination resulted in this cribbage board with a new twist, fabricated out of $\frac{1}{4}$ -in. sheets of acrylic. The top sheet, which is transparent, has three rows of 120 holes each, with colored pegs used to set them off in groups of five. The bottom sheet is cut from colored acrylic sheet. The two sheets are screwed together. Made of Plexiglas by Whitehead Associates, 146 Hanover St., Providence 7, R. I.

There are innumerable uses for this Refrig-O-Bag, made of leather-like vinyl with a snap-in replaceable vinyl inner bag. It will keep ice from melting too fast and will retain the water from the melted ice. It is handy for taking cold drinks or food on a picnic or an auto trip, or for transporting the baby's formula, frozen foods, or freshly caught fish. It is made of Velon by Refrig-O-Bag Co., 435 Sexton Bldg., Minneapolis 15, Minn.

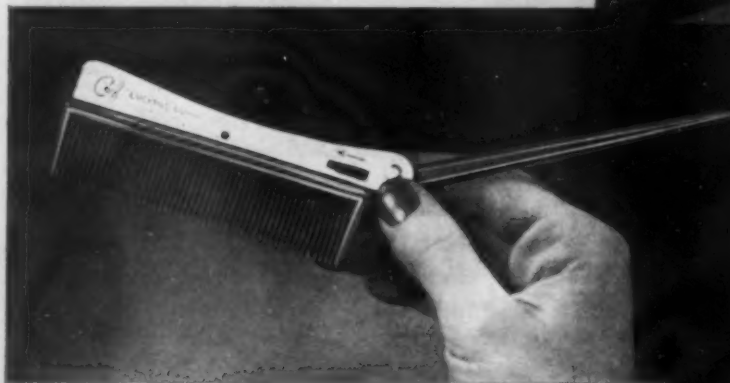
The pistol grip on this soldering iron assures the user of a firmer, less tiring grip than is possible with conventional soldering irons. The use of general purpose phenolic for molding the grip also decreases the weight of the tool and protects the user from the heat developed by the iron. Len Mfg. Co., Newton Lower Falls, Mass., makes the iron, using Bakelite phenolic





▲ The cellulose acetate handle of this brush was attached to the brush itself by a newly patented process for putting thermoplastic handles on twisted-in-wire brushes. The wire tangs are heated and put in place. The acetate flows around the wire, thus sealing it in position. The process was developed by the Fuller Brush Co., Hartford, Conn.

► An ordinary radio can be converted into an FM receiver by attaching this Telvar FM Tuner. Phenolic is used for the cabinet of the tuner, which is available in black, walnut, or white (the white model is sprayed). Modern Plastics Corp., 489 North Shore Drive, Benton Harbor, Mich., molds the cabinets for John Meck Industries, Inc., Plymouth, Ind.

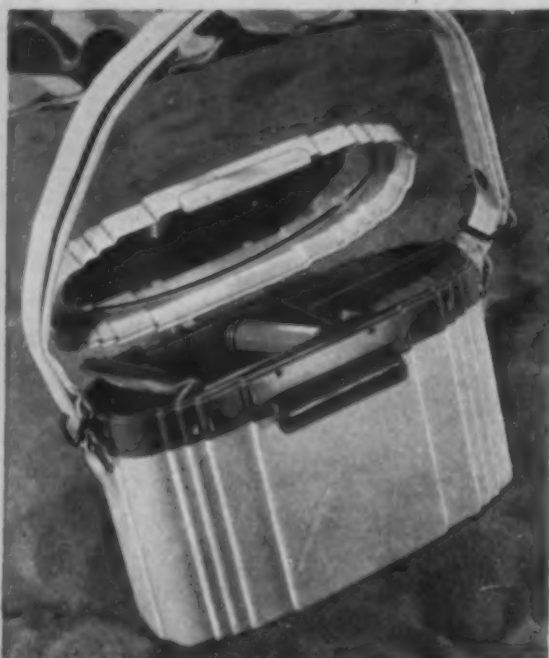


◀ Most women who like to use rat-tail combs like to carry small combs in their purses. They can do both with this plastic folding comb, the Foltail. The three polystyrene parts (the comb, the rat-tail, the latch) are molded by S-K-W Mfg. Co., 4448 West Harrison St., Chicago, Ill., for Coif Products Co., 5457 West Chicago Ave., Chicago 51, Ill.

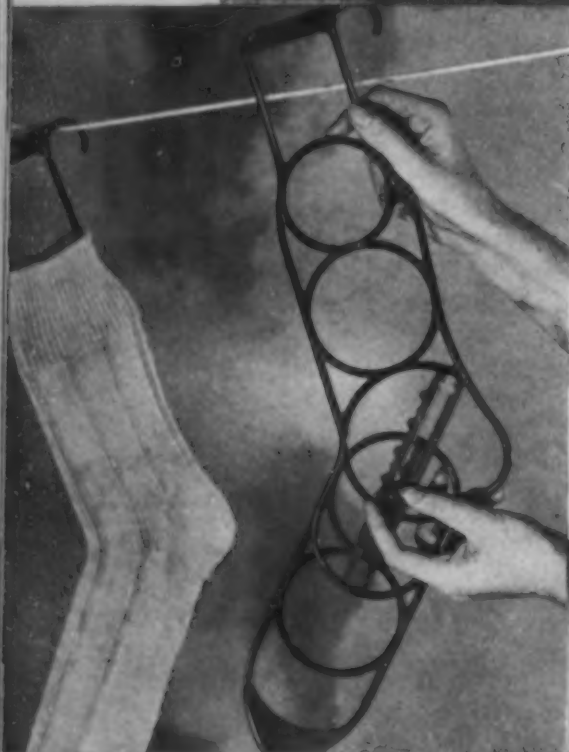
► Draftsmen, artists, or engineers who often must have an ellipse handy will find use for this set of cellulose nitrate ellipse templets. Ellipse sizes range from $\frac{3}{8}$ in. to $2\frac{3}{4}$ in., major axes, and the templets have projection ranges of 20°, 30°, 45°, and 60°. Sizes and center lines are printed on the negative side of the templets to prevent wear. Made by Rapidesign, Inc., P. O. Box 582, Glendale, Calif.



The molded urea cases in which these two cosmetic gift sets are packaged have re-use value as trays after the container holding the individual items is removed. One set is red urea embossed with gray rose sprays; the colors are reversed in the other set. Plastic & Die Cast Products Corp., 1010 E. 62nd St., Los Angeles 1, Calif., molds these sets of Plaskon for Max Factor

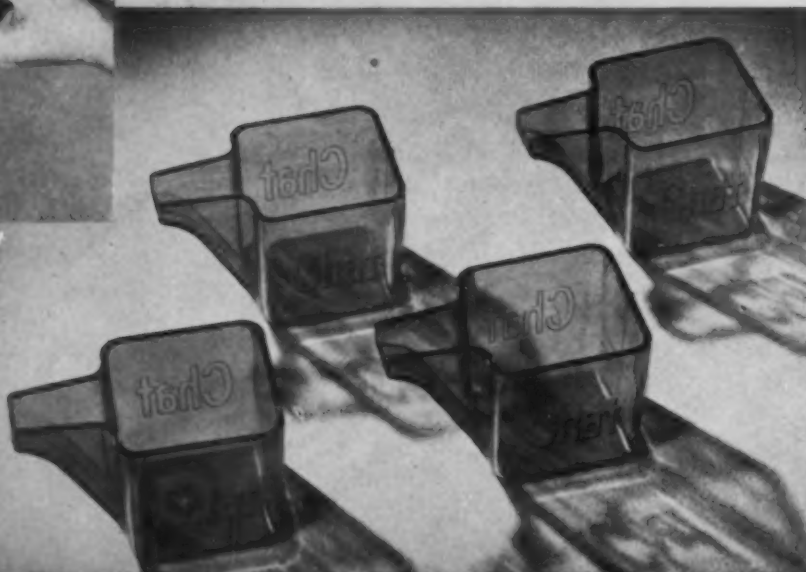


A beach kit is subjected to strong sunlight, salt air, and sometimes salt water. It also may be thrown around in the sand. This one can stand such abuse because it is made of cellulose acetate in two hinged sections. The kit is molded of red, white, or black Tenite by Standard Molding Corp., 1517 East 3rd St., Dayton 1, Ohio, for Mikah Plastics Corp., 38 West 32nd St., New York 1, N. Y.



Wet socks ranging in size from 9 to 13 can be dried in proper shape and size on this adjustable wool sock stretcher molded of cellulose acetate butyrate. Sock tops can be clipped to the upper crosspiece, thus preventing any shrinkage in length as well as in other dimensions. Manufactured by Craft Industries, Inc., of 11 Niagara St., Buffalo 2, N. Y., using Tenite II

Chat, a detergent, is used in dish washing machines with lids which open only a small amount. So these polystyrene measuring cups, which empty at a 60° angle, were designed for General Aniline and Film Corp. by Michael Saphier Associates, 33 East 8th St., New York, N. Y. Molded by Superior Plastics Div., Commonwealth Plastics, Inc., 426 N. Oakley Blvd., Chicago, Ill.



Plastics Products



As every mother knows, ordinary diaper pins often open accidentally and stick the baby. That can't happen to this Reddy diaper pin. The patented ethyl cellulose head has a groove which prevents the pin from opening when it is squeezed unless an upward pressure is applied to the point. Celcon is used by the Reddy Co., P. O. Box 57, Needham Heights, Mass., to make the pin heads

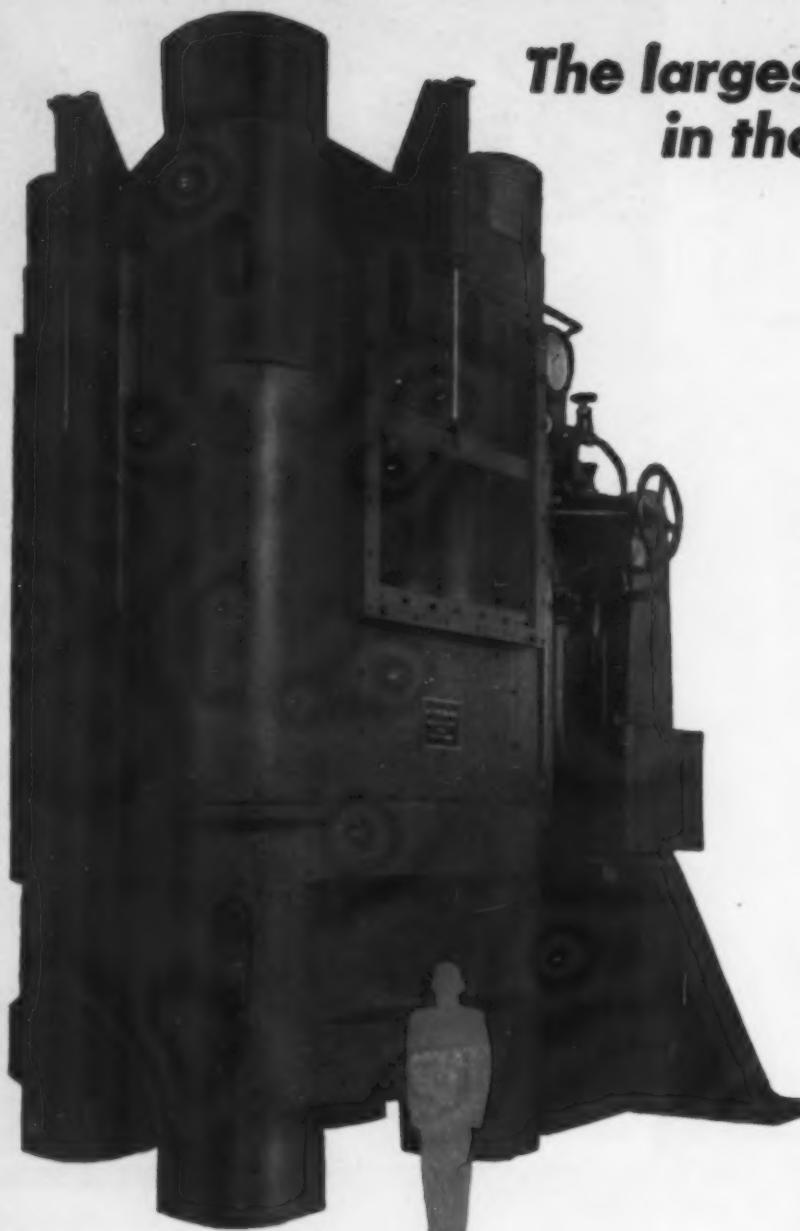


A paradoxical plastic product is this white "blackboard" made by spraying and baking Vinylite on a wood-fiber board. Special crayons, which produce no chalk dust, are used to write on the board. Markings can easily be erased with a dry cloth. Light green, light yellow, buff, and light gray surfaces are also available. The boards are made by the Chatfield-Clarke Co., New York, N. Y.

A small depression just inside the lip of this polyethylene pouring spout prevents any of the milk from dripping down the side of the bottle when it is returned to an upright position. An adapter ring makes it possible to use the spout on any size milk bottle. Bakelite polyethylene is used for the three parts (spout, ring, and cap). The spout is molded by the Livingstone Mfg. Co., Akron, Ohio



This letter opener is actually as sharp as a razor because its cutting edge is a razor set into the polystyrene handle. A narrow crotch prevents the user from touching the cutting edge by accident. Plastics Associated, Salt Lake City, Utah, makes the polystyrene Envelopener, which was designed by Andrew C. Karlstad, Sherman Oaks, Calif.



The largest hobbing press in the plastics industry

Hobbed Cavities by Midland...

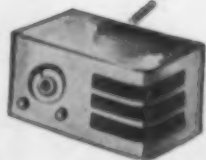
An important addition to Midland's expanding facilities is this 8000 ton hobbing press, the largest of its kind in the plastics industry.

This mammoth press with a ram diameter of 39½ inches makes it possible for Midland to hob cavities of approximately 80 square inches . . . almost tripling former hobbing limits.

With this press, Midland is prepared to supply plastic molders with hobbed cavities for large plastic parts including radio cabinets, large container escutcheons and instrument housings. Multiple cavities can be hobbled . . . "like peas in a pod" . . . quickly, with complete uniformity and accuracy. Multiple cavities will speed up your production with a minimum of expense.

Midland experience and facilities, in addition to skilled craftsmen, are ready to serve you . . . to produce the finest and deliver on time when you specify "Hobbed Cavities by Midland."

Write for your copy of "How to Heat Treat Hobbed Cavities," a practical heat treating treatise to help you get the best performance from Hobbed Cavities by Midland.



Cavities for:

Radio Cabinets



Escutcheons



Instrument Housings



MIDLAND DIE AND ENGRAVING COMPANY

1800 W. BERENICE AVENUE . . . CHICAGO, ILLINOIS

Makers of Plastic Molds ★ Die Cast Molds ★ Engraved Dies ★ Steel Stampings ★ Hobblings ★ Pantograph Engraving

Plastics Engineering

F. B. STANLEY, Engineering Editor

Highlights of 1947

In general

MANY NEW process and molding procedure developments as well as several new machines for molding, fabricating, and processing plastics materials were announced during 1947.

The plastics industry weathered a very serious slump in business during the first part of the year. Many injection molding plants were practically closed down and the compression field, while not as seriously affected, was running at only a percentage of capacity.

This set-back saw the end of the seller's market; it doomed the production of poorly designed and poorly molded gadgets. The weak fell by the wayside and during the last half of 1947 the more stable companies were producing well-made plastic parts which found a ready market. These newly designed parts made it necessary for the mold makers to work overtime. From September 1947, as these new molds began coming into production, the dollar volume of plastics parts produced increased enormously.

Many plants, in order to streamline their production and at the same time increase their quality, have installed new molding and finishing equipment. In some cases complete modernization programs have been instituted. Although the sales of new machines in 1947 did not equal the 1946 volume, it was still a good year for most machinery manufacturers.

Specifically

In preparing this review of plastics engineering progress in 1947, space limitations made it more than difficult to select those developments for extensive treatment from the many which warrant more than passing mention. Among those outstanding developments which cannot be described in detail here are the following:

- a) Lester Engineering Co., Cleveland, Ohio, perfected its internally heated spreader.
- b) De Mattia Machine & Tool Co., Clifton, N. J., placed an improved material grinder on the market.
- c) Modern Plastic Machinery Corp., Lodi, N. J., perfected a hydraulic monofilament spooling unit.

* Registered U. S. Patent Office.

d) Fellows Gear Shaper Co., Springfield, Vt., completely revamped and redesigned its spreader so that its initial claimed capacity is greatly increased.

e) The efficiency and workability of high frequency preheating and heat sealing units have been increased.

f) Blaw-Knox Co., Pittsburgh, Pa., stands ready to deliver "packaged resin plants."

The balance of this review will be devoted to brief and factual descriptions of as many new processing developments and machines as space will permit.

Portable wood welder

An electronic machine which eliminates the need for placing electrodes on both sides of wood parts to be glued is offered by the Short Wave Plastic Forming Co., Burbank, Calif. The production speed gained by use of high frequency is said to offset the higher cost of synthetic adhesives and to permit the stronger glue line construction obtainable with such glues as the ureas, phenols, resorcinols, melamines, and furfurals.

With the Woodwelder, the hand gun need only be applied to the face surface to cure the glue line through the stock as far as 1 in. from the electrodes.

Spotting on edge gluing should require about 10 sec. to penetrate through a $\frac{3}{4}$ -in. joint. When shooting directly through the wood or panel, a few trials are required to determine the time necessary to set the glue. A great deal, of course, depends upon the type and moisture content of the material being used. Normally, the penetration rate is about $\frac{3}{16}$ in. per sec. on dry panels and increases proportionally with the amount of moisture in the wood.

The applications which can make use of the Woodwelder are many. Furniture manufacturers may now weld mortised and various other types of joints while they are under pressure in an automatic air cylinder clamp. Glue blocks can be welded in place within a few seconds; waterfall designs or curved rosettes can be accurately positioned; edge-gluing of core stock may be speeded.

On the repairing end, the former method of raising



PHOTO COURTESY SHORT WAVE PLASTIC FORMING CO.

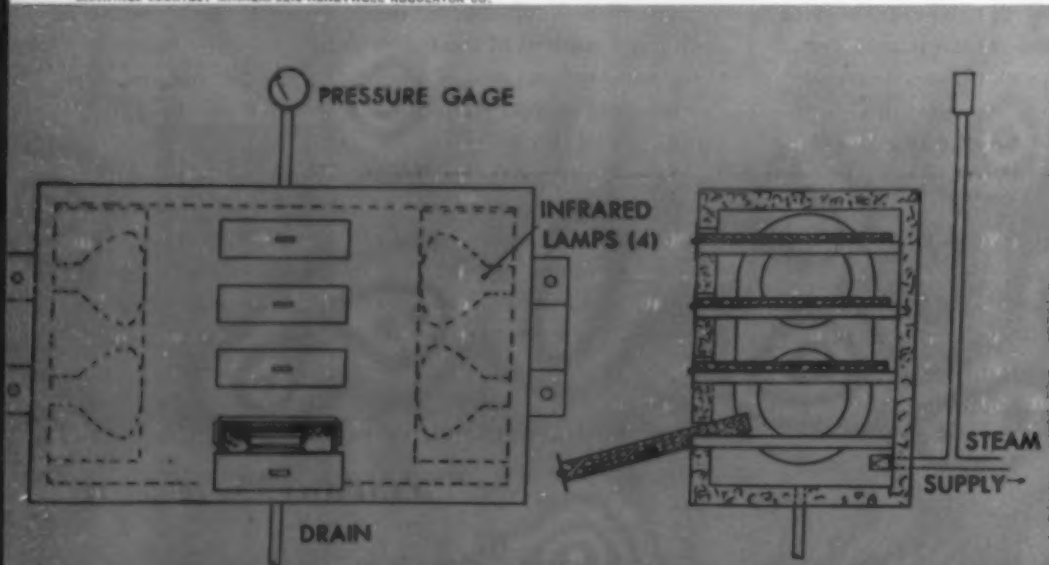
Using portable welder, an operator can glue wood blocks to sub-flooring in a few seconds

dents, nicks, or marred spots in solid or veneered materials by steaming with a hot iron or by igniting alcohol over the damaged area is now replaced by a 10-sec. operation. A few drops of water may be placed on the damaged area, the electrodes placed over the surface, and high-frequency energy applied.

Preheating with steam

The problem of preheating plastics materials is now one of major importance throughout the molding industry. While several factors are responsible for this, probably the most important is the large scale use of the transfer molding process. For this process, it is imperative that the molding compound be softened to some degree in order that transfer of the materials into the mold cavity may be accomplished. Obviously, it is of advantage to have the material softened before the cycle begins.

DRAWINGS COURTESY MINNEAPOLIS-HONEYWELL REGULATOR CO.



Positions of the infrared lamps used to speed up preheating are shown in this cross-section view of a steam preheating cabinet

A new version of an old technique of softening molding materials involves the addition of moisture, usually in the form of steam, to the molding material previous to loading it into the mold or transfer pot. A standard preheating cabinet can be used in which an atmosphere of saturated steam is maintained. During the preheating process, these cabinets may or may not be heated by additional heat sources, such as infrared heat lamps, electric resistance elements, or steam coils.

It has been found that charges preheated by this system produce transfer molding results which are approximately equal to those produced by dielectric preheating in every respect except electrical characteristics. Parts which are transfer molded from material preheated in this manner are cured in a shorter time, are more easily released from the mold, and do not stain the mold as rapidly as when dry powder is used.

The addition of moisture to the molding material serves to lubricate and thus allow the material to flow faster through the runners and gates. This probably causes a more rapid generation of heat due to friction at the gate which in turn further plasticizes the molding material.

Preheat time control

Besides the purely mechanical function of lubrication and its subsequent benefits to molding, there is another effect of moisture in the molding operation. With most forms of preheating, it is very important to have the preheating time under close control. In a few instances this close control has also been found necessary to a degree in moist preheating. However, in the majority of tests run, it was determined that the time control factor in moist preheating for transfer molding was nowhere near as precise as that required for the preheating of non-moistened powders.

Development work carried on by the research engineers in the Plastics Laboratory of Minneapolis-Honeywell Regulator Co., serves to indicate the value of moist preheating for transfer molding. The economy of this type of preheating was shown to be one of its chief values and this economy becomes more and more pronounced as the size of the part to be molded increases. The research also indicates that this method

Typical of the hollow articles with small holes which can be molded by a new process are the two trumpet mutes at extreme right. Moldings without holes can also be turned out as shown by mute at the extreme left. All three are produced from polyester resins reinforced with glass fiber flock



of preheating, in spite of its simplicity and low cost, is an eminently suitable means of cutting molding costs without appreciably impairing the quality of the finished product.

Vertical injection press

Vertical construction, which incorporates the use of a single hydraulic cylinder, characterizes the new vertical plastics injection press introduced by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. This arrangement, a departure from conventional horizontal presses, provides for clamping the mold halves together and injecting the plastic material into the mold cavity in the same stroke of the piston rod:

The piston is hydraulically powered by a self-contained hydraulic unit which forms an integral part of the machine. When the cylinder is activated the piston rod movement operates a toggle mechanism. This initial downward movement of the piston rod locks the die plates together. As the piston rod continues its downward movement, it also serves as a plunger to inject thermoplastic material into the mold.

Molding hollow objects

Research and development by George W. DeBell have now made possible the economic production of one-piece hollow thermosetting articles without any hole (as a ball) or with a small hole (as a bottle). For several years hollow articles have been made from the thermoplastics by blow molding, but low cost production of such parts from thermosetting materials has only recently been realized.

While the details of the new process cannot as yet be divulged, it may be said that the resulting products are similar to slush molded metal or thermoplastic articles in that the external contour is accurately controlled by the shape of the mold while the internal contour varies slightly from piece to piece.

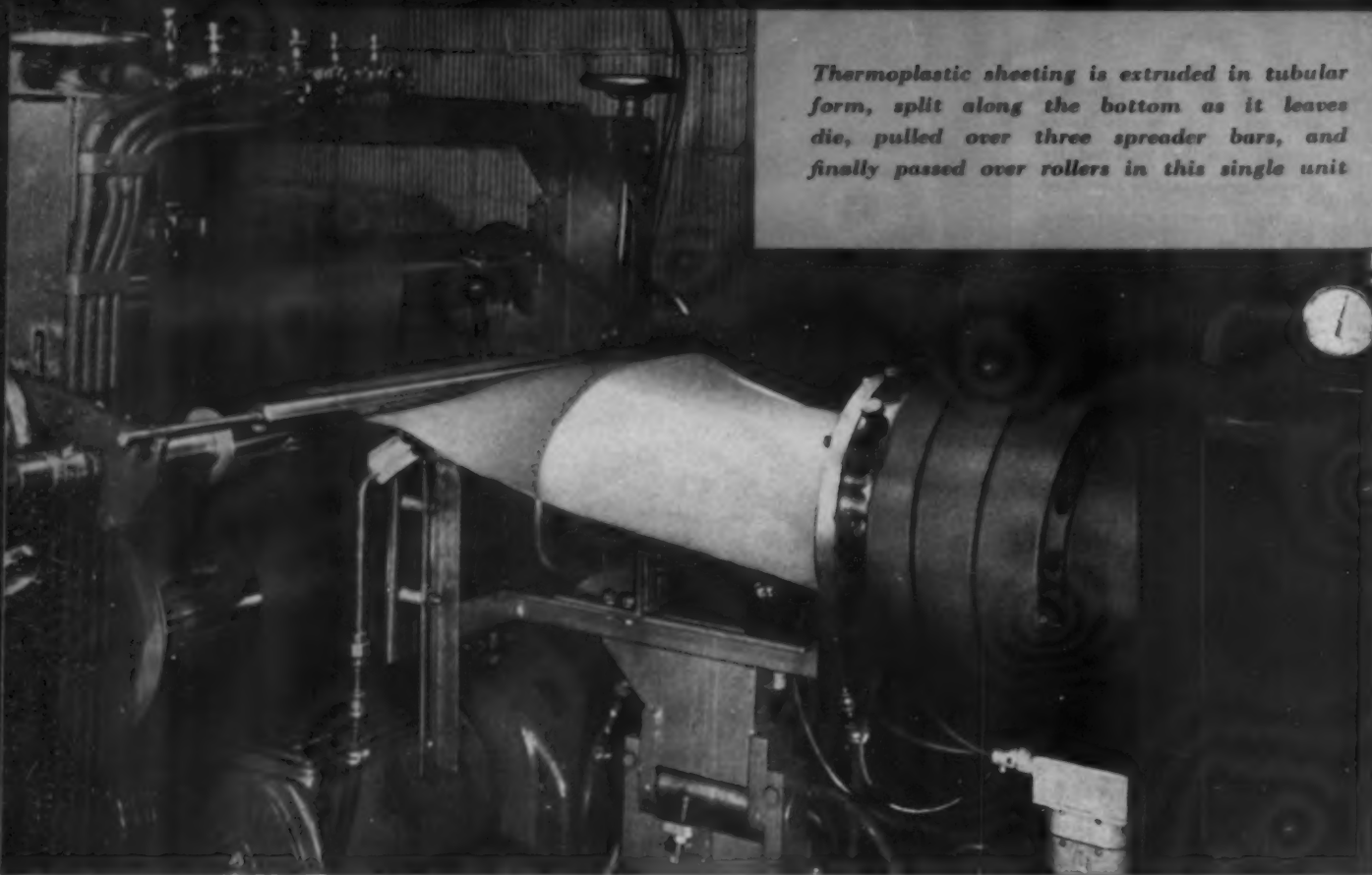
By this new process, hollow products can be com-

pleted in a single molding operation. Although the raw materials used in the new process are more expensive than the phenolic molding materials, this differential is, in a majority of cases, more than offset by the elimination of assembly costs.

Either single or multiple cavity molds may be used in this method of molding, depending on the shape and size of the articles and on the production volume required. At present, the products can be produced only in opaque colors, but it is hoped that further research in raw materials will eventually permit manufacture of transparent and translucent items. Inserts of certain types can be incorporated in the article, and molded holes can also be included. *(Please turn to next page)*

Clamping of mold halves and injection of material into the mold cavity in one piston rod stroke feature new vertical injection press





Thermoplastic sheeting is extruded in tubular form, split along the bottom as it leaves die, pulled over three spreader bars, and finally passed over rollers in this single unit

PHOTO COURTESY NATIONAL RUBBER MACHINERY CO.

Up to the present, cure times under 5 min. have been attained and it is anticipated that these will be further reduced as modified types of raw material become more readily available.

Sheeting unit

Thin-gage thermoplastic sheeting can now be turned out in volume on a single unit, offered to the industry by National Rubber Machinery Co., Akron, Ohio. On the basis of the quality of this sheeting, the volume production, and the savings in cost, it is anticipated that the machine will prove particularly valuable to big-volume producers of packages who are potentially tremendous users of plastics.

The equipment consists of a standard 3½-in. oil heated extruder, a special sheeting die, and a pull-off and cooling unit which automatically trims the thermoplastic sheet, cuts it to length, or winds it up on reels.

The unit is basically the same as the one originally developed by Tennessee Eastman Corp., somewhat modified by the machinery company engineers to adapt it for commercial operations. In test runs the machine has produced clear cellulose acetate sheeting, 24 in. wide but trimmed to a 22 in. width, at a rate of more than 150 lb. per hour. Thicknesses of 8 to 40 thousandths are obtainable. Experimental department tests indicate that other thermoplastics may, in time, be usefully extruded in sheet form on the equipment.

While test production has thus far been confined to

24-in. wide sheeting, the pull-off equipment can handle stock up to 36 inches. A die head for this width sheeting, which is interchangeable with the smaller head, can be made available.

The circular sheeting die

The especially developed 9½-in. diameter circular sheeting die is very much like that of a tubing die. It is, of course, of utmost importance that the interior of this die, especially the spider supporting the mandrel, be very carefully streamlined and highly polished. Both the inner and outer die rings of the mandrel are interchangeable. The outer ring is also concentrically adjustable with screws closely spaced around the circumference. By replacing the outer ring, the gage of the plastic sheet may be varied.

The spreader bars

Immediately as it leaves the die, the horizontally extruded sheet in the shape of a tube is slit open on the bottom. This is accomplished with an interchangeable knife-like insert, blocking off a more or less small portion of the die opening. The split tube is then pulled over three spreader bars which gradually open it up to form a flat sheet.

The sheet of plastic material is air cooled as it leaves the die and passes over the spreader bars. When cellulose acetate butyrate is extruded, two circular jets blow warmed air against the inside and outside of the sheets. The inner jet, along the inner die ring, is generally used alone when cellulose acetate is the material.

Another tube, formed along the edge of the first two

spreader bars and drilled with a large number of holes, sprays the heated air against the plastic before it can touch the bars themselves. The air chills the surface of the still soft sheet, thus protecting it from scratches, and also serves as a lubricator carrying the sheet over bars.

The pull-off unit

From the spreader bars, the last one of which is located directly next to the first roll of the pull-off unit, the plastic sheet is pulled through the pull-off unit, trimmed in width, and automatically cut to length or wound on a reel, whichever is desired. The pull-off unit, which provides take-off speeds from 4 to 24 ft. per min., accommodates sheet up to 36 in. wide. It consists of two units, front and rear, which are about 4 ft. apart. In this distance, the still warm and pliable plastic sheet is lightly stretched and then cooled. Stretching is accomplished by running the rolls of the rear unit at somewhat higher speeds than the rolls of the front unit.

The fairly cooled plastic sheet coming from the front roller unit is further cooled by the water-cooled rolls of the rear roller unit.

At the rear roller unit, the plastic sheet is pulled tightly over two rolls approximately 16 in. apart. Two rubber snubbing rolls pressing with adjustable spring tension against each one of the steel rolls prevent the plastic sheet from slipping. This is especially important because the driven slitter knives trimming the sheet to uniform width are located between the two steel rolls of this rear unit. By the time the sheet reaches the knives, it must have been cooled so it is entirely set and hard.

The rolls of both the front and rear roller units are hollow—in the case of the front rolls so they can be heated to keep the sheet pliable and in the case of the rear unit so they can be cooled to stiffen the sheet.

The cutter

The frame of the rear roller unit supports the guillotine-type cutter and its air-operated toggle mechanism, with which the continuously extruded sheet is automatically cut to a given length.

Automatic box making

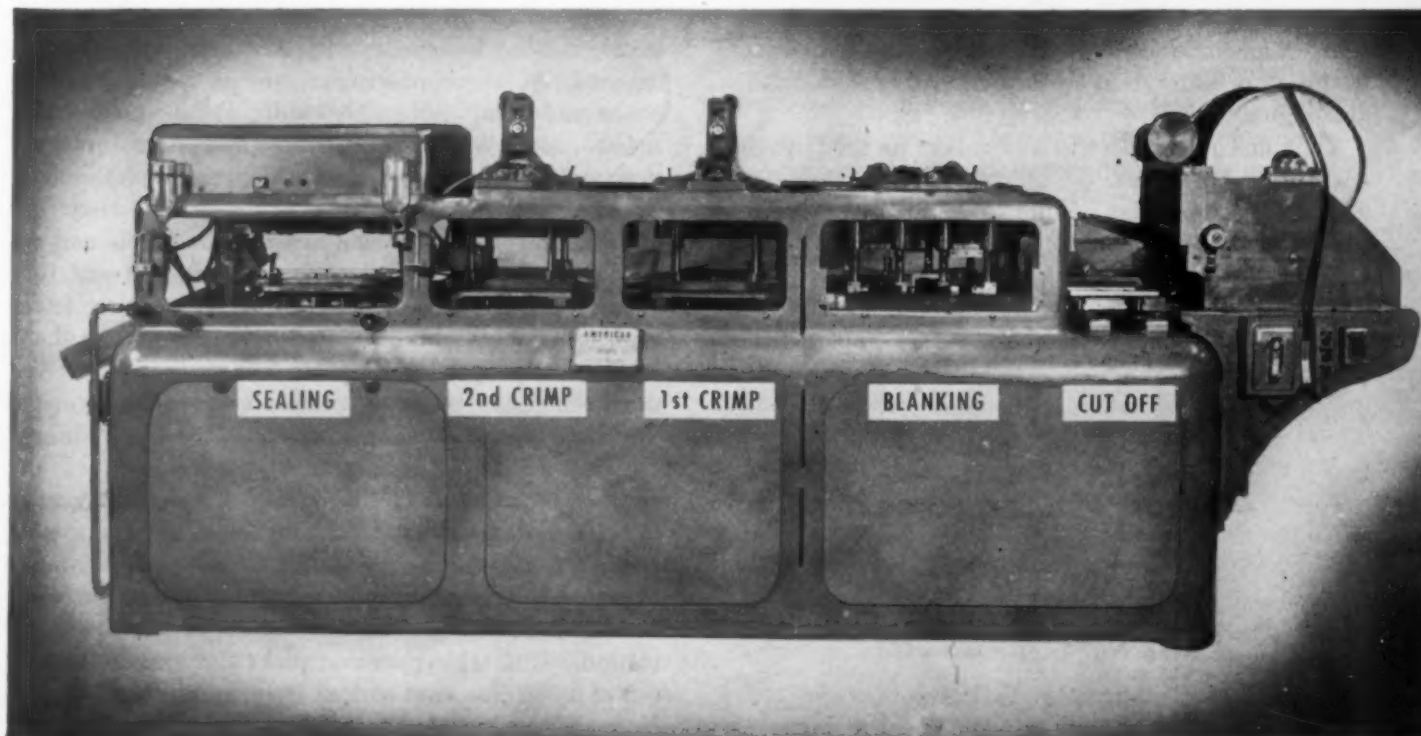
Transparent plastic sheet stock may now be taken from a roll and made automatically, on one machine, into boxes at a rate of 1000 per hour. The boxes can be either square or rectangular and the machine is infinitely adjustable between an upper limit of 13¹/₄ in. on a side and a lower limit of 2¹/₂ in. on a side. The height of the boxes may vary from 1¹/₂ to 4 inches. The plastic sheet stock may be from 0.005 to 0.020 in. thick. Although cellulose acetate sheet has been most widely used in the development work on this project, the indications are that any thermoplastic sheet stock will work satisfactorily, provided a proper solvent is available for gluing the box seams.

The machine that does this work is the Trans-Bo-Matic, a development of the American Tool Works Co. of Cincinnati, Ohio.

How well worked out were the company's original

Thermoplastic sheet material is taken from the roll at right, passes through five operational station of this automatic machine, and emerges as a square or rectangular box

PHOTO COURTESY AMERICAN TOOL WORKS CO.



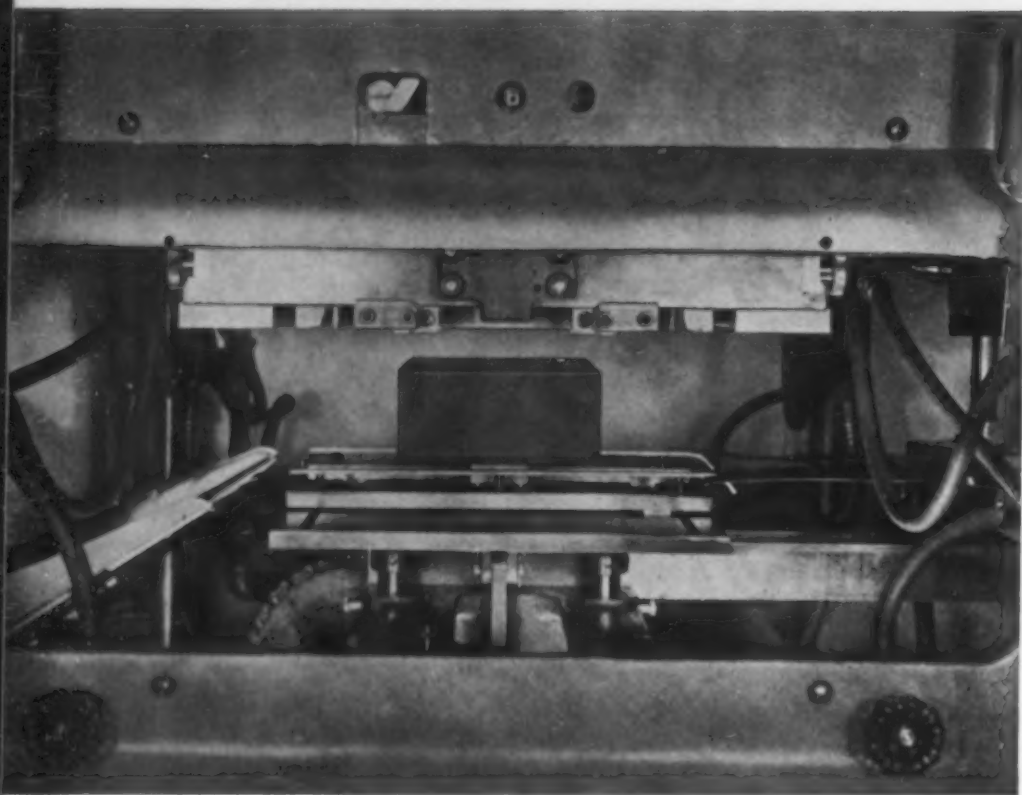


PHOTO COURTESY AMERICAN TOOL WORKS CO.

Box with sealed corners has been lowered from the gluing position. The box is now ready to be stripped off the vacuum cups and discharged from the automatic machine

ideas regarding this automatic box-making machine are evidenced by the specifications laid down at the start of the work. The machine that is now being given its field test meets every one of these six original specifications:

1. A machine wherein the die cost of various sizes of boxes is nil or reduced to a very minimum.
2. A machine wherein the changeover time from one size box to the next is reduced to a minimum.
3. A machine wherein the output in boxes per hour is in the medium range—not a huge device with a stupendous output purchasable by only a few firms.
4. A machine substantial enough to stand up under the heavy pressures that are encountered in work on this kind of material.
5. A machine which will offer maximum safety to the operator and the plant.
6. A machine that can be split into two parts for transportation in small elevators to upper stories of buildings.

There are actually five progressive steps in the transformation of plastic sheet stock into a completed box using this new machine. The roll sheet stock, slit to the proper width, is mounted in position on the machine. The steps in sequence are:

- No. 1—cut-off
- No. 2—blanking
- No. 3—first crimping
- No. 4—second crimping
- No. 5—sealing.

Step No. 1—the cut-off

At the cut-off station, the first step is made in the production of the box. A rack and pinion feeding device

may be set to feed the desired length of stock, which comprises the width of the box. Before this blank is cut from the roll, it is fastened to a set of nine vacuum cups mounted on an indexing block. A series of these blocks are fastened, in turn, to a chain which runs the entire length of the machine. The chain is indexed 24 in. between each cycle in order to feed the blanks from station to station.

At each station there is a pick-up table which operates vertically. After the chain has placed the indexing block into its proper position, the table rises and locates the block accurately by means of tapered locating pins. As it continues to rise, it raises the block off the chain and continues upward until it has placed the thermoplastic sheet in position for the particular operation performed at that station. After the operation has been performed, the table is dropped so that the indexing block again engages with the chain and is carried along to its next location. At station one, the operation consists of first forcing the suction cups against the sheet so that it is gripped securely and then cutting the proper length of stock from the roll. This sheet remains with its particular indexing block until the box is completely formed.

Step no. 2—blanking

After the cut-off has been completed, the chain and block are indexed 24 in. to the second station where blanking is performed. At this point the block rests directly above its locating holes in the corner stamping station. The table rises and picks the indexing block out of its chain socket and, at the same time, raises the lower dies against the sheet. As the table rises higher it

encounters the upper half of the dies and stamps out the four corners of the box.

The four corner stamping dies are a set of male and female dies made of hardened tool steel. They are suspended from a casting on top of the machine and are adjustable in all four directions by lead screws with vernier reading scales. They can be set for any size blank within the range of the machine.

With the four corners cut from the plastic box blank, the table returns to its original position where the block is once again set in its chain socket and is moved along to the next station where the first crimping operation is performed.

Step no. 3—first crimping

The dies at this station, which serve to bend up two sides of the box, are long parallel blades at the top and grooved bars at the bottom. In this operation a bead approximately $\frac{1}{16}$ in. wide is molded along two of the bottom sides and, at the same time, a like bead is molded on all four of the vertical sides. Tests made on the crushing strength of boxes with these beads showed them to be approximately twice as strong as boxes whose sides were only bent and not beaded. This provides more structural strength than would ordinarily be the case and consequently allows use of lighter gage sheet for a given application.

The dies are hot and their temperature is determined by the thickness and type of sheet involved. These dies as well as the stamping dies are adjustable to and from the center line of the machine and their length permits the forming of any size sheet within the range of the machine.

Step no. 4—second crimping

As the block is indexed to the next, or second crimping station, it is rotated 90° by passing the indexing block over a cam. The second crimping station is exactly the same as the first and operates in the same manner. At this station the two remaining sides of the box are bent up. The chain then indexes to the final or sealing position.

Step no. 5—sealing

After the motions necessary to complete all sealing operations had been laid out, it became apparent that only $\frac{1}{2}$ sec. would be available for pressure on the completed joint. Since the box was formed in the machine with its sides in a vertical position, it was necessary to print the solvent on the box in a strip approximately $\frac{1}{4}$ in. wide and 4 in. high to insure the top part of the joint receiving as much solvent as the bottom part. After several months of experimenting an applicator was developed that would do this work with gravity feed directly through a porous metal plate. The metal components of this plate as well the method of its fabrication are being held confidential. It is possible that this ingenious development may have many other uses in addition to its present job in this box-making machine.

For this sealing station a male form must be produced

for each size box although one form will produce any height box within the limits of the machine as long as the length and width remain constant. As the vertical moving table at the sealing station moves up and carries the indexing block, and its partially formed box into the operating position the four sides of the box are clamped against the form while four porous metal wicks print a line of solvent along the vertical edges of the box. As soon as the solvent is printed, another set of movable arms approaches the block at right angles to the motion taken by the wicks. This set of arms carries small pressure pads that force the flaps on the box around the corner of the box and apply the necessary pressure for sealing. As these pressure pad arms move into the form they force back the solvent applicators so that the flap can be pressed on the surface of the box which has previously been printed with the solvent. After the pressure pads have held the pressure against the flap for approximately $\frac{1}{2}$ sec., the movable arms return to their original position and the box is ready to be removed from the form. As soon as the table at the sealing station starts downward, carrying the indexing block with it, air is turned on by a cam. This air forces knockout pins downward. These pins are located inside the form and serve to force the box off the form and hold it on the table and on the rubber suction cups while they are descending.

As the chain is then carried through its next indexing cycle, it passes through a slot in the discharge chute where two arms strip the box from its vacuum cups and discharge it from the machine. The chain then rides over a sprocket and eventually returns the indexing block to the starting end of the machine.

Detecting metals

The metal detector is an electronic inspection device for detecting unwanted metal particles in all kinds of non-metallic products or materials such as molding powders, fillers, resins, plastic sheeting, films, biscuits, or preforms. It will assure a product free from all metal—

Plastic biscuits are checked by metal detector prior to putting them into a record press

PHOTO COURTESY RADIO CORP. OF AMERICA, RCA-VICTOR DIV.



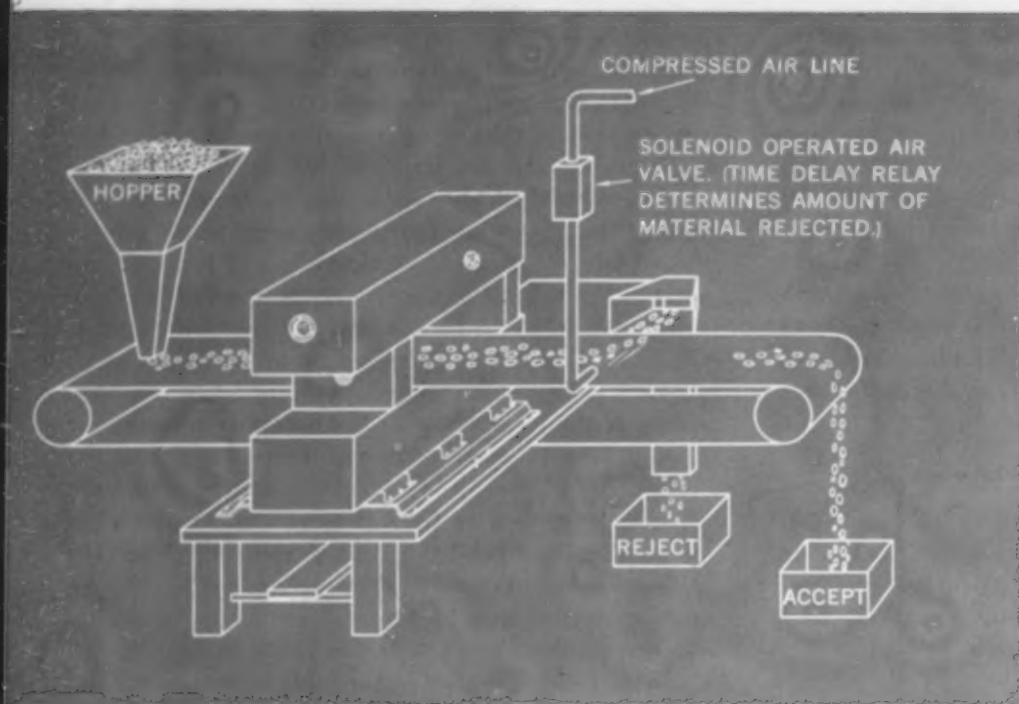


PHOTO COURTESY RADIO CORP. OF AMERICA, RCA-VICTOR DIV.

Here an electronic metal detector is set up for inspection on conveyor belt. Compressed air is used instead of a reject vane to eject any material which contains metal particles

magnetic or non-magnetic, ferrous or non-ferrous. Tin, copper, iron, steel, aluminum, gold, silver, stainless steel, bronze, metal scale, iron rust, etc., will be spotted by this electronic sleuth. It will detect metal particles no matter how deeply they may be buried in the material under inspection. The first units produced by Radio Corp. of America, RCA-Victor Div., have been in continuous operation for some time and have given completely satisfactory service.

Construction and operation

The metal detector consists of two box-like compartments or heads separated by two Bakelite spacer blocks to form an opening called the inspection aperture. Except for the plastic panels which form the top and bottom of the inspection aperture, the unit is constructed of aluminum. The material to be inspected is passed through the inspection aperture where it is continuously screened by a high frequency field set up by coils imbedded in the plastic panels. When metal is detected, a reaction is caused which triggers a signalling device and either stops the conveyor or movement of the material being inspected or operates an automatic rejector for removal of the contaminated material.

The detector may be employed with conveyor installations at speeds up to 600 ft. per min. with full inspection sensitivity. It may be used as a completely portable unit, may be operated on an incline, or may be mounted endwise for tall packages or side wise for inspecting falling material. It may be employed for bulk material or packaged commodities, for powders, chemicals, drugs, wood-pulp, paper, strip material such as films or sheeting, panels, sand, rubber, bread, and flour.

One of the first commercial installations was at the Columbian Rope Co., in Auburn, N. Y., where three

metal detectors are used to inspect the entire output of Co-Ro-Lite, a resin impregnated rope fiber plastic material. In the manufacture of this sheeting, or web, by the felting process, a needle board containing thousands of needles is employed. The constant vertical movement of the needles in and out of the material occasionally results in a broken needle being imbedded in the web. It is to detect these broken needles that the detectors are used.

The plant superintendent estimates that absence of needles, which formerly damaged dies, has probably saved several thousand dollars yearly. This compares favorably with a cost of \$2000 for the metal detector.

Processors of plastic film or sheet material could probably employ an arrangement similar to the one in this plant, should it be deemed desirable to assure a metal-free product. The day is not far away when purchasers of plastic sheeting and films will insist upon some guarantee that the material is uncontaminated by metals or oxides.

Metal detection in record production

Another installation has been in operation for many months for the inspection of plastic biscuits prior to putting them into a record press. The plastic used in this work is a vitrolac compound and sometimes it contains metal particles which cannot be seen with the eye yet can do damage to the matrix used in the press. Thus the use of the detector protects the processing equipment at the same time that it insures product quality.

In this particular instance, a full-time operator is employed to feed the biscuits onto an endless belt which carries them through the inspection aperture of the metal detector. When tramp metal is detected, the

belt automatically stops and the operator removes the contaminated preform. She then pushes a button to restart the belt and continue the inspection operation.

An installation in a material plant

The Bakelite Corp. has installed a metal detector in its Bound Brook, N. J., plant to assure that certain types of plastics are metal free and it is planning to install a battery of five detectors in another plant for the inspection of Vinylite molding powders before processing them into plastic sheet.

For plastic molders and fabricators to be able to buy from suppliers on the basis of specifications guaranteeing metal-free bulk material is both a new and needful condition from which the whole plastics industry would benefit. A great deal of money is represented by the molds, calenders, embossing rollers, engraved plates, etc., that are employed in plastics processing and this investment should have protection from tramp metal.

Tools from laminates

In the manufacture of all manner of metal products, special tools are required to perform certain definite fabricating operations. These are generally called project tools and include drill jigs, checking and assembly fixtures, and forming tools. In aircraft as well as in many other sheet metal industries the parts are of complex contour and curvature. Since the tools used in the fabrication of such parts must necessarily follow every intricacy of contour, their manufacture can be expensive and time consuming.

When the tools are made of steel, many or all of the following operations are involved: cutting, forming, assembling, welding, reforming to remove welding warpage, fitting, and grinding. Low pressure molded laminates eliminate all of these tedious operations and yield average time savings of 60 percent. Moreover it has

One advantage of molded laminates in tools such as the routing fixture below is light weight, allowing easy handling at machines

PHOTO COURTESY REPUBLIC AVIATION CORP.

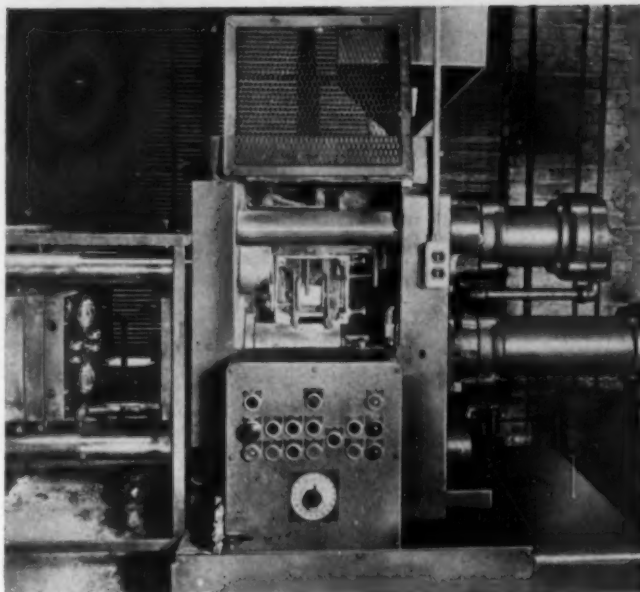


PHOTO COURTESY ROCKFORD MACHINE TOOL CO.

Preforming, metering, preheating, and molding are combined in this new automatic molding machine. At left, mold is shown open and in center a preform is located between electrodes. The oscillator is shown in lower center

been found that contours are more faithfully reproduced and that the tools are less liable to distortion and damage in service. The usefulness and practicability of this method are further evidenced by the fact that at the plant of the Republic Aviation Corp., Farmingdale, L. I., N. Y., molded laminate tools have entirely replaced steel tools in all suitable applications.

The actual process of manufacturing laminate tools is well known to the low pressure industry as vacuum bag molding. This method lends itself to this work since generally only one tool, or at most a few duplicate tools, are made. Although the method involves high labor costs, considerable economies over steel are effected through the bag molding.

In some cases the tools are molded over sample metal parts but, more generally, gypsum plaster molds (either male or female) are used. These are made directly from the master model plasters known as mock-ups.

The inherent accuracy, low bulk, and light weight of laminated tools, combined with the relatively versatile method employed in their manufacture, makes this system adaptable to many types of tools—not only in aircraft but also in such other manufacturing lines as automobiles, buses, trucks, boats, furniture, and, of course, sheet metal products. In short, they can be used in any industry requiring various holding fixtures.

Automatic molding

A new molding machine that functions automatically throughout the complete production cycle from granular material to finished product has been developed in the

plant of the Rockford Machine Tool Co., Rockford, Ill.

All movements of this machine are hydraulically powered, electrically controlled, and automatically timed through a complete cycle, which includes preforming, dielectric preheating, and molding. The material hopper is of conventional design and fills an adjustable measuring chamber by gravity. From this chamber the measured amount of powder is fed, again by gravity, to the preform chamber. The preform plunger automatically moves forward and makes a preform of the proper density. The preform is then dropped into the dielectric preheating chamber.

The next step in the cycle is the mold closing. After mold clamping has been completed, the preform is automatically dropped from the electrodes into the molding cylinder, after which the molding plunger, actuated by the lower hydraulic cylinder, advances rapidly and forces the preheated material into the die. The material then passes through the runners and gates into various cavities of the mold, completing its cure. The sequence of operations overlaps to present a preheated preform in readiness for molding as the previous moldings complete their cure. As the mold opens, the operator removes the entire shot. Of course, a safety gate must first be opened by the operator before it is possible to reach in between the mold cavities and remove these parts. Any flash remaining on the force plugs or in the cavities is then blown off by compressed air and the cycle is restarted by closing the safety gate.

Heater of special design

All movements of the machine may be push-button controlled from the operator's position if manual operation is desired. This permits quick setup and proper timing of the cycle and also ease of adjustment of the various portions of the cycle as well as simple maintenance. For automatic operation a complete cycle is actuated from the control panel and once the timers and controls are suitably set, they interlock and assure com-

plete and accurate cycling with no further attention.

A patented hydraulic circuit makes the preforming and molding movements fast and powerful without the use of accumulators or double cylinders. The builders claim that the hydraulic circuit produces maximum speed when required with a minimum horsepower input.

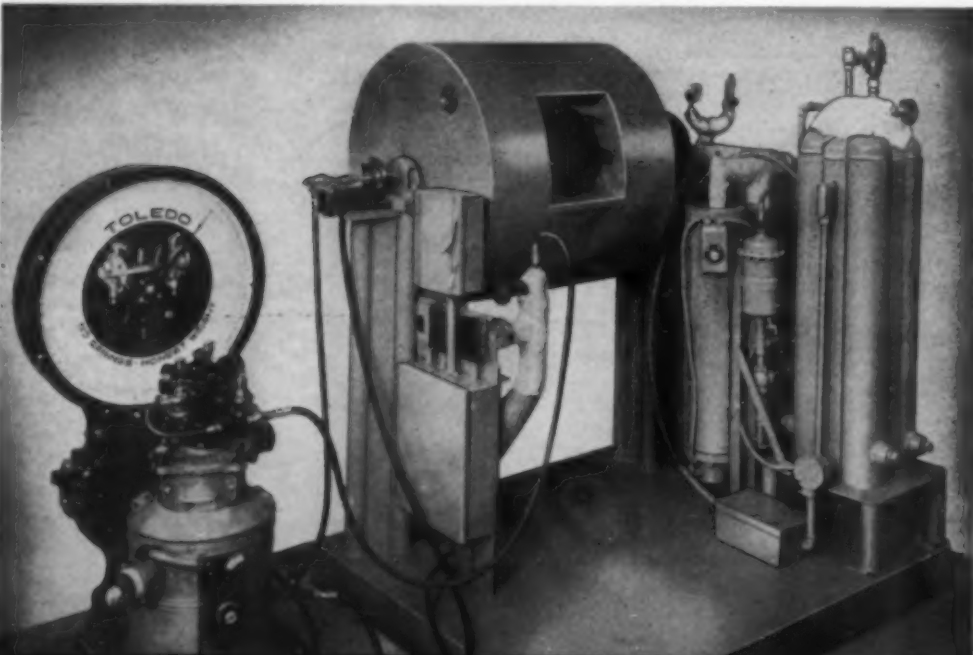
In this operation there is little if any flash because the mold is closed and tightly clamped before the material is forced into it. Because of the optimum dielectric preheating cycle and the minimum time lapse between preheating and molding, comparatively low pressures are required for the molding operation. This results in a minimum of wear on runners and gates as well as on the cavities and force plugs and also permits the incorporation of delicate inserts in the molded parts.

Compounding machine

A process for compounding many different types of plastic materials has been developed by the Hungerford Plastics Corp., which also is producing the machine by which the process is applied. The process is fundamentally different from the solvent method, the Banbury method, and the hot roll method of compounding plastic materials in that the material remains in powder form throughout the process.

In operation, the flake or resin, the dye, pigment, stabilizers, fillers, etc., are charged into a compounding chamber mounted so that it can be rotated. While the chamber is rotating, the plasticizers and other liquid additives are injected into the chamber by means of the Dreyfus spray process, patent on which has been assigned to Celanese Corp. of America. After processing, the mass is dehydrated and discharged from the machine. By this compounding method, fusion and mechanical working are not required, and the material is ready for molding at the end of the dehydration operation.

PHOTO COURTESY HUNGERFORD PLASTICS CORP.



Forty pounds of resin or flake per hr. can be compounded in this laboratory machine with rotating chamber. Mechanical working, fusing are unnecessary

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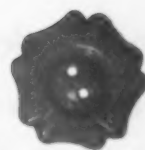


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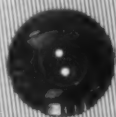


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Housing molded of a Claremont flock-filled plastic compound by Shaw Insulator Co. Irvington, N.J.

Photo, courtesy of Shaw Insulator Co.

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Technical Section

DR. GORDON M. KLINE, Technical Editor

Advances in plastics during 1947

Two full years have gone by since the end of World War II. During the war period, 1939 to 1945, the plastics industry quadrupled in size. Many wondered whether the industry could maintain this high level of production in peacetime. The years 1946 and 1947 have supplied the answer. Reconversion has not meant retrenchment; on the contrary, each of these years has seen the establishment of new production records.

The foundation for further healthy growth of the industry is evident in this annual review of technical progress in 1947. The results of many war-time researches on the preparation and properties of polymers and copolymers have been published; progress reports of similar investigations currently under way in industrial, university, and government laboratories have appeared. These are cited in this review, as are also a number of investigations of the still more basic relationships between molecular structure of polymers and their physical properties.

ONE of the many indications of continued expansion of the plastics industry is the considerable number of surveys which have been conducted regarding the sources of its raw materials and its present and potential markets. Some which have been published during 1947 deal with coal and petroleum,¹ acetylene and ethylene,² and formaldehyde.³ The facts seem to point conclusively to petroleum, natural gas, and chemicals derived from annual crops, such as furfural,³⁵ for the future supply of chemicals for the plastics industry.

Materials

An interesting addition to the roster of synthetic resins is a thermoset product made by the polymerization of diallyl phenyl phosphonate.^{4, 5} This derivative of phosphoric acid can be copolymerized with other monomers to impart flame resistance, increase in index of refraction and hardness, and a decrease in solubility.

The index of refraction of the pure polymer is 1.57. By copolymerization with methyl methacrylate, a product having the same index of refraction as that of glass can be synthesized, thus permitting the production of glass cloth laminated structures with a high degree of transparency.

Another new and promising polymer is a British product known as "Terylene."⁶⁻¹⁰ It is made by polycondensation of terephthalic acid and ethylene glycol and yields fibers with a high modulus of elasticity and outstanding resistance to heat, light, and water. The fibers are thermoplastic, resistant to micro-organisms and chemicals, and have a high ratio of wet to dry strength.

The vinyl alkyl ethers¹¹ became available in this country following reports of their large scale production and utilization in Germany in the form of resinous coatings, adhesives, and impregnating agents. There was also considerable research and development work under way both here and abroad on the production of polyisocyanates¹² and their utilization in the plastics and textile fields,¹³ stimulated by earlier German work.

Polytetrafluoroethylene¹⁴⁻¹⁷ continued to find new uses in applications where high temperature and corrosive conditions have to be met. The four major characteristics of this plastic—chemical inertness, heat resistance, dielectric strength, and nonadhesive qualities—have been utilized in diversified mechanical, chemical, and electrical outlets where long service life and, consequently, low replacement cost compensate for relatively high initial cost. The properties of polychlorotrifluoroethylene¹⁸ were described. The properties and applications of polyethylene¹⁹ were reviewed.

The silicon resins are establishing themselves firmly in the chemical and electrical industries. Silicone-glass laminates²⁰ were investigated for panel boards, circuit breakers, and walkways over batteries on submarines. Silicone resins²¹ were used in protective coatings and impregnating varnishes for glass-insulated wires. Silicone rubbers²² were made into gaskets, seals, and press pads for use where heat resistance up to 400° F. and low temperature flexibility to -40° F. are required. The applications²³⁻²⁴ and properties²⁵ of these resins were described in various reports. (Please turn to next page)



Gaskets, packing rings, tubes, and tape show some of the new uses of tetrafluoroethylene¹⁴

The scope of the markets for nylon resins^{26, 27} was expanded during 1947. Among the applications explored for this versatile plastic were rope,²⁸ watch straps,²⁹ lock nuts,³⁰ grommets, conveyor belts, and gyro parts.³¹ The properties of polyamides made with various diamines and dibasic acids were described.³²⁻³⁴ Culmination of 12 years of research work brought the announcement that furfural will be used as the raw material for the manufacture of hexamethylene diamine, one of the main ingredients of nylon resins.³⁵ Furfural is obtained from agricultural sources, such as oat hulls and corn cobs; hence it is available in essentially unlimited quantities as an annual crop.

Styrene resins forged ahead to a new production record in a diversity of applications. A polystyrene molding material with an A.S.T.M. heat distortion point of 87 to 88° C. compared to 78 to 80° C. for standard polystyrene became available.³⁶ It is anticipated that the higher heat resistance of this compound will be advantageous in household merchandise, surgical and medical appliances, and industrial equipment, lighting fixtures, and electrical insulating parts. A surface treatment to improve the scratch resistance of polystyrene was announced.³⁷ A styrene-base casting resin resulting from war-time research on the proximity fuze was described by the National Bureau of Standards.³⁸ The compound has excellent dielectric and chemical resistance properties and may be especially useful in high-impedance control devices in steel mills, plating plants, and other factories handling corrosive chemicals as well as in the potting of components for radar and other electronic equipment. The production and polymerization of styrene^{39, 40} and its derivatives^{41, 42} were reported upon by a number of investigators.

Considerable attention was focused on the vinyl resins during the year as several new plants came into production or neared completion. Further advances in the art of coating, dipping, molding, and casting resin-plasticizer pastes⁴³⁻⁴⁵ were recorded. Synthetic rubber of the butadiene-acrylonitrile type has been compounded with vinyl chloride resins to combine the oil,

chemical and age resistant properties of the latter with the solvent resistance and flexibility of the former.^{46, 47} The combination avoids the troublesome factor of plasticizer migration. Polyvinylidene chloride extended its markets as film,⁴⁸ filament,^{49, 50} and latex.^{51, 52} The Saran latex produces coatings on paper, fabric, yarns and leather which have a high degree of resistance to chemicals and impermeability to water vapor and gases. The uses of polyvinyl carbazole⁵³ for low-loss electrical assembly parts were outlined. Fluorinated vinyl derivatives^{54, 55} were studied.

An acrylic injection molding compound with an A.S.T.M. heat distortion point of 90° C. was announced.⁵⁶ Another innovation in this field was a process for synthesizing methyl methacrylate from acetylene and acetone.⁵⁷ A scratch-resistant coating for acrylic plastic consisting of hydrolyzed ethyl silicate and polyvinyl acetate was reported.⁵⁸ Polyacrylonitrile fibers⁴⁶ characterized by flexibility, resiliency, high tenacity, and resistance to heat, light, and chemicals are undergoing development.

Polyesters⁵⁹ have been "tailored" to provide the special properties required in impregnating, laminating, casting, molding, and bonding applications, respectively. The fully saturated alkyd-type of polyester has been studied to obtain improved flexibility⁶⁰ and hardness.⁶¹ Modern equipment for producing alkyd resins was described.⁶²

The chemistry and technology of phenol,⁶³⁻⁶⁷ resorcinol,⁶⁸ urea,⁶⁹ melamine,⁷⁰ and furfural⁷¹ resins received attention. A phenol-furfural resin varnish⁷² developed for laminating is claimed to impart better electrical and mechanical properties than does the cresol-base varnish and to be free from the uncertainty of supply and nonuniformity of the latter product.

Low and contact pressure laminates made with polyesters^{73, 74} and cellulose acetate⁷⁵ were discussed. The University of California's atom smashing synchrotron⁷⁶ uses 10 low pressure laminated parts, one a ring 3 ft. in diameter and weighing 650 pounds. Glass fibers and fabrics for use in such laminates were the subject of two reviews.^{77, 78} Problems involved in improving the mechanical strength⁷⁹ and flame resistance⁸⁰ of cotton fabric-base laminates were considered. There was decreased activity in the sandwich structure field, attributable to high labor costs. However, some notable contributions appeared on this subject.⁸¹⁻⁸⁴ Vulcanized fibre⁸⁵ continues to find extensive application as electrical insulation in arc interrupting devices.

Developments in the field of cellulose plastics⁸⁵ included further activities with ethyl cellulose,^{86, 87} carboxymethyl cellulose^{88, 89} cellulose propionate,⁹⁰ cellulose acetate butyrate⁹¹ and marketing of a cellulose acetate propionate compound.⁹² Research on cellulose phthalates and tetrachlorophthalates was reported.^{92*}

Production in Canada of a low melting point, moldable lignin was announced.⁹³ The material is currently used in a phenolic-lignin enriched, paper-base laminate employed for decorative purposes in buildings. Other uses for lignin were reviewed.⁹⁴⁻⁹⁶

A continuous board made from sawdust and cresol-formaldehyde resin with the aid of electronic heating promises to help meet the shortage of wallboard in Great Britain.⁹⁷ The problems encountered in the utilization of wood wastes were discussed.⁹⁸ Improvement in the properties of wood by resin treatments has extended the markets for both materials.⁹⁸⁻¹⁰³

Synthetic polyisoprene¹⁰⁴ lends itself to the production of resinous products by cyclizing, chlorinating, and addition of hydrogen chloride. These products as well as butadiene-styrene copolymers of high styrene content¹⁰⁵ are useful in protective coatings,¹⁰⁶ floor coverings, paper coatings, and rubber reinforcement. Two authors reviewed developments in elastomers¹⁰⁷ and hard rubber,¹⁰⁸ particularly with regard to their use in corrosion-resistant chemical equipment.

A noteworthy contribution to the chemistry of high polymers was the synthesis of protein-type macromolecules.¹⁰⁹ Fibrinogen and other plasma proteins can be converted into plastics by heat treatment with polyhydric alcohols.^{109*} Modification of casein by higher fatty acids¹¹⁰ improves the properties of molding powders made from it. Other reports pertained to the manufacture of casein bristles,¹¹¹ alginate fibers,¹¹² synthetic waxes,¹¹³ allyl sucrose resins¹¹⁴ for coatings, mastic-like polymers by sulfurization of petroleum products,¹¹⁵ and acenaphthylene polymers.¹¹⁶

Experimental and theoretical examination of plasticization phenomena received the attention of numerous authors.¹¹⁷⁻¹²⁰ Surveys of particular groups of plasticizers were published.¹²¹⁻¹²³

A new source of fillers for plastics and adhesives became available when a bark processing plant¹²⁴ was put in operation in the State of Washington. Noteworthy articles reviewed fillers,¹²⁵⁻¹²⁷ fungicides,^{128, 129} coloring materials,¹³⁰⁻¹³² and peroxide catalysts.¹³³

German plastics

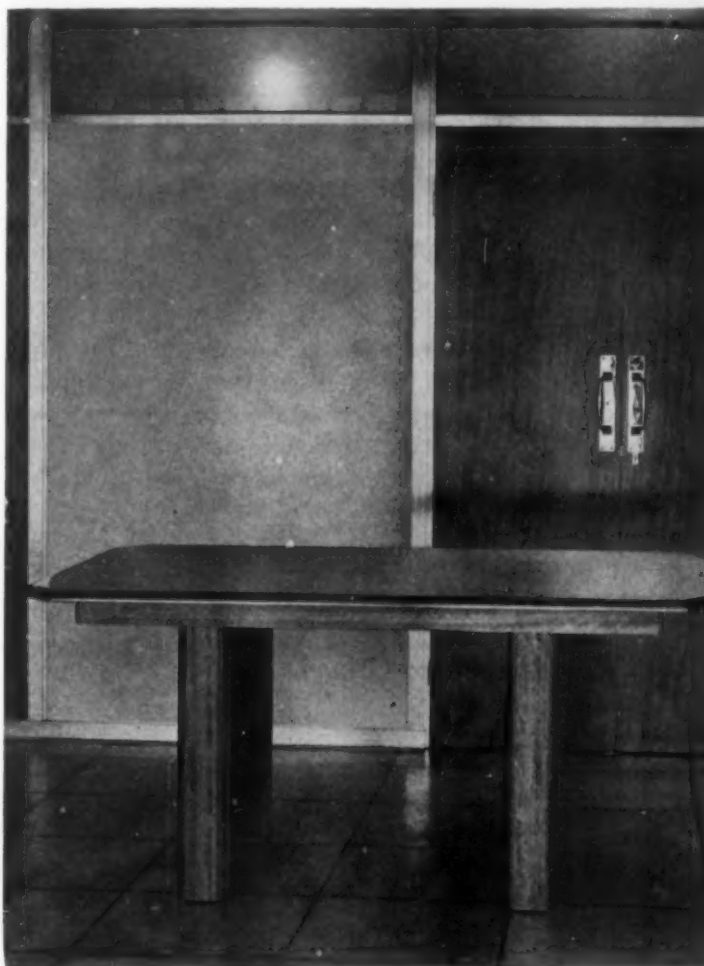
Important contributions to our knowledge of the technology of plastics appeared in the form of further summaries of German practices. The materials covered by articles during the year included polyvinyl ethers,^{134, 135} polyvinyl chloride,^{136, 137} acrylate¹³⁸ and methacrylate¹³⁹ polymers, styrene¹⁴⁰ and polystyrene,¹⁴¹ polyurethanes,¹⁴² and thermosetting resins.^{143, 144} Other reports related to adhesives¹⁴⁵ and acetylene chemistry.¹⁴⁶ A bibliography of reports on German developments in plastics was published.¹⁴⁷ A wealth of engineering and research reports continue to arrive in this country from Germany during 1947 and were made available to the industry by the Office of Technical Services, Department of Commerce.

Processing

Developments in the field of casting resins were particularly prolific during the year. Centrifugal casting of fast-curing phenolic resins¹⁴⁸ makes possible the production of prototypes, low-cost molds for small numbers of aircraft and industrial parts, and heavy section items impractical by ordinary molding methods. A cold-pour

plastic material useful for novelties, statuary, and advertising articles is composed of gypsum plaster and urea-formaldehyde resin.¹⁴⁹ After baking at a temperature not over 150° F., it is reported to be considerably superior to plaster casts in strength and abrasion resistance. The design and execution of art objects, lamps, chessmen, and the like from various types of plastics received considerable attention.¹⁵⁰⁻¹⁵² Detailed directions were given for the formulation and processing of a plasticized vinyl composition suitable for flexible casting molds.^{153, 154} Processes for casting biological specimens in transparent polyester¹⁵⁵ and acrylic resins^{156, 157} for preservation were published.

Improvements in molding practices¹⁵⁸⁻¹⁶¹ became important as the industry returned to more competitive trade conditions. Factors involved in precision molding of phenolic parts to ± 0.0015 in. were discussed.¹⁶² Size limitations of molded parts are reported to depend largely on the development of a molding compound requiring pressures only of the order of 200 p.s.i. to permit use of lower cost molds.¹⁶³ A new technique¹⁶⁴ for producing molds impossible to hob and costly to machine



A new laminated board,⁸⁴ consisting of surface sheets of paper base laminated stock or actual wood veneer bonded and supported by impregnated paper "girders," can be employed in furniture, panelling, doors like those above



Cables jacketed with polyblend resin⁴⁷ are flexible, resistant to oil, chemicals, aging

involves pressing metal powder over a master hob and sintering at 2300° F.; this process is an outgrowth of the use of sintered steel powder during World War II for the manufacture of radar parts to close tolerances. A new molding machine¹⁶⁶ automatically molds thermosetting materials by performing the functions of measuring out a definite quantity of the material fed to it from a hopper, preforming it, preheating the preform dielectrically, and injecting the soft plastic through runners and gates into various cavities of the clamped mold where the cure of the resin is completed. Slush molding of hollow thermosetting products was reported.¹⁶⁶ An electronic metal detector¹⁶⁷ also an outgrowth of a war-time development, serves to indicate the presence of unwanted metal particles in plastic raw materials and products and thus protects fabricating equipment from damage.

An innovation in preheating practice consists of a steam cabinet; it is reported that parts transfer molded from material preheated in this manner are cured in a shorter time, are more easily released from the mold and do not stain the mold as rapidly as when

Sterilization is possible when strainers are made of new high heat resistant polystyrene³⁶

PHOTO COURTESY CHICAGO IMPRESSION DIE & MFG. CO., AND PLASTIC METAL MFG. CO.



dry powder is used.¹⁶⁸ Other heating problems considered in the literature include dielectric preheating,^{169, 170} injection cylinders,^{171, 172} infrared heating of thermoplastic sheets,^{173, 174} and heat sealing^{175, 176} and welding¹⁷⁷ thermoplastics.

Extrusion techniques for polyethylene,¹⁷⁸ polyvinylidene chloride,¹⁷⁹ and for cellulose nitrate, polyvinyl acetate, and polyisobutylene plastics containing crystalline fillers¹⁸⁰ were studied. A new method of forming acrylic sheets, called ridge forming,¹⁸¹ employs a skeleton mold that makes contact with the plastic only at major shape-determining locations. Many other helpful pointers on fabricating,¹⁸² embossing,¹⁸³ and die cutting¹⁸⁴ acrylic sheets were described. The art of fabricating cellulose acetate¹⁸⁵ and other thermoplastic sheet materials was advanced by the development of two new machines. One is a fully automatic box-making mechanism¹⁸⁶ which can cut off the sheet stock, form the blank, crimp it, and seal the corners at a rate of 1000 boxes per hour. The other is a unit for making sheeting of 0.008- to 0.040-in. thickness and up to 36 in. wide continuously by combination of an air-heated tubing extruder, spreaders which gradually open the slit tube to a flat sheet, and a pull-off and cooling unit which automatically trims the sheet and cuts it to length or winds it on reels.¹⁸⁷ Methods of manufacturing¹⁸⁸ and printing¹⁸⁹ on plastic films were reviewed.

A new process for compounding plastics¹⁹⁰ involves spray injection of the plasticizer and other liquid components into a rotating chamber charged with the flake or resin, coloring materials, fillers, stabilizers, and other solid components. This method of compounding avoids the use of solvents or fusion of the mass with subsequent mechanical disintegration. Application of plastics as coatings by flame spraying¹⁹¹⁻¹⁹² has been particularly successful with polyethylene, polyvinyl chloride, and polysulfides. Methods and equipment for sawing,^{193, 194} grinding,¹⁹⁵ plating,^{196, 197} and vacuum coating metals on plastics¹⁹⁸ were described. Adaptation of rapid fabricating methods to the molding of low pressure laminates¹⁹⁹ and investigation of problems involved in forming dome-shaped parts by post-forming thermosetting laminates²⁰⁰ were noteworthy contributions during the year in the laminating sector.

Applications

It would be difficult to single out any particular category of products as outstanding with respect to progress in the utilization of plastics during 1947. Rather, the year was marked by continuing advances in many diverse outlets, such as telephones,^{201, 202} sound recordings,^{203, 204} radio,²⁰⁵ photography,²⁰⁶ printing,^{207, 208} refrigerators,²⁰⁹ luggage,²¹⁰ flooring,²¹¹ signs,^{212, 213} business machines,²¹⁴ housings,^{215, 216} furniture,^{217, 218} boats,^{219, 220} tools and jigs,²²¹⁻²²³ ion exchangers,²²⁴ core binders,²²⁵ bearings,^{226, 227} and electrical insulation.^{228, 229} Other industries that employed plastics to improve their equipment and products include brewing,²³⁰ textile,^{231, 232} paper making,^{233, 234} powder metallurgy,²³⁵ and chemical manufacturing.²³⁶

New uses were reported for plastics in the transportation industries. Interior paneling with wood grain effect for station wagons, made of phenolic paper-base laminate,²³⁷ highlighted developments in the automotive field.²³⁸ Laminated seat backs, vinyl upholstery and shades, and acrylic signs and windows are among the increasing number of applications of plastics in buses.²³⁹⁻²⁴³ Practically all types and forms of plastics are represented in the accessories, decoration, lighting equipment, and glazing of the Train of Tomorrow,²⁴⁴ indicative of another expanding market for these materials.²⁴⁵⁻²⁴⁹ Published reports concerning developments in the aircraft field were fewer than in the previous years of intense expansion of this industry; the applications discussed included propellers,^{250, 251} bullet-proof fuel tanks,²⁵² and transparent enclosures.²⁵³

Resinous pills that are taken internally as a treatment for stomach ulcers, functioning by absorbing acid,²⁵⁴ and artificial eyes²⁵⁵ made of methyl methacrylate resin were among the medical applications^{256, 257} reported. The manufacture of acrylic and styrene lenses^{258, 259} for television, camera, projector, railway signal, and other optical equipment was described; other optical applications of plastics were reviewed.²⁶⁰⁻²⁶³

The advantages and limitations of plastics in the building field were discussed.²⁶⁴ Polystyrene tiles²⁶⁵ represent a major new material for adding color and serviceability to kitchen and bathroom walls; their low water absorption, excellent dimensional stability, and resistance to discoloration and staining are important factors in this application. Many other uses of acrylic,²⁶⁶ nylon,²⁶⁷ styrene,²⁶⁸ phenolic and vinyl²⁶⁹ resins in home accessories and decoration were reported.

Further additions to the list of resin treatments for fibers to improve their performance properties were announced.^{270, 271} These finishes provide control of the shrinkage of wool, retention of crispness in sheer fabrics under moist conditions, durability of glazed chintzes when washed, moisture²⁷² and stain resistance to many textile products, and flameproofing.²⁷³ Developments in coated fabrics²⁷⁴ and fibers²⁷⁵ and in synthetic fibers^{276, 277} were described. A technique for copying natural horn in button making is based on regulated addition of colored and transparent urea molding powder to the mold.²⁷⁸

The packaging industry continues to consume large quantities of vinyl,²⁷⁹ vinylidene, styrene,²⁸⁰ polyethylene,²⁸¹ cellulose acetate, and rubber derivatives in the manufacture of transparent containers, coated papers and textiles,²⁸² and wrapping materials for display and protective purposes.²⁸³ The rapidly growing frozen foods branch of the industry has adapted plastic films²⁸⁴ and hot-melt coatings²⁸⁵ to their needs.

The No. 1 customer of the synthetic resin trade, the organic protective coatings industry, explored still further the practically infinite combinations of film-forming bases and other materials used in formulating paints and lacquers.²⁸⁶⁻²⁹⁰ Developments in the use of coatings based on cellulose derivatives,²⁹¹⁻²⁹³ vinyls,²⁹⁴⁻²⁹⁶ phenolics,²⁹⁷ rubber²⁹⁸ and zein²⁹⁹ were described.



PHOTO COURTESY FIRESTONE INDUSTRIAL PRODUCTS CO. AND HAFNER ASSOCIATES, INC.

Upholstery woven of polyvinylidene chloride monofilaments³⁰ such as these seat coverings on a commuter train hold up under heavy wear

This recounting of the expanding market for plastics in the year just past would not be complete without mention of the booming balloon business.²⁹⁹ In this year of elections, these non-collapsible plastics can be recommended to politicians for use in their inevitable trial balloons.

Adhesives

Plywood and laminated wood products were the major consumers of resinous adhesives;³⁰⁰⁻³⁰⁴ reports relating to this field spotlighted developments in phenolic,³⁰⁶ resorcinol,³⁰⁶ protein,³⁰⁷ and urea³⁰⁸ glues and the effects of acidity,^{309, 310} moisture,³¹¹ temperature,^{312, 313} and marine organisms³¹⁴ on joint strength. Other important uses for adhesives included applications in automobile body assembly,³¹⁵ brake linings,³¹⁶ and optical lenses.³¹⁷ Special adhesives for bonding metal,^{318, 319} rubber,³²⁰ and plastics³²¹ were described. A portable electronic machine³²² which eliminates the necessity for placing electrodes on both sides of the part to be cured promises to extend the utilization of the thermosetting resin glues in such applications as wall coverings, flooring, gates, furniture, and the like. The ultra high frequency unit transmits the current from an electrode down through the glue line as far as 1 in. away and back up to the other electrode thus effecting a complete circuit and curing the resin adhesive. Reviews were published concerning

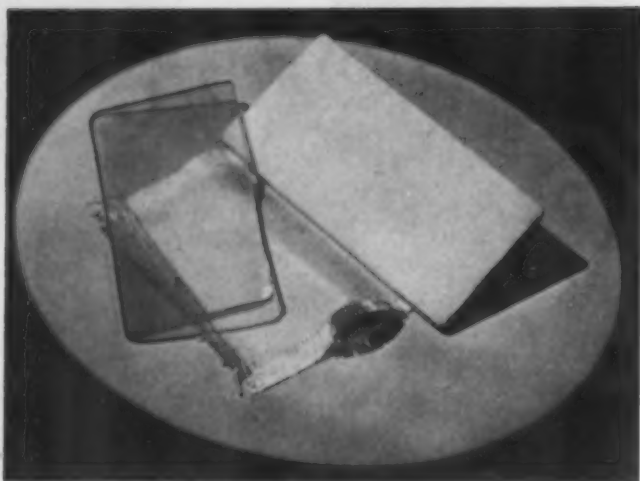


PHOTO COURTESY VICTOR CHEMICAL WORKS

Each of these laminates, shown on glass cloth, contains 10 layers of glass fabric. However, new resin⁴ makes sheet at right transparent

the general principles of selection and application of adhesives^{323, 334} and the fundamentals of adhesion.³²⁵

Properties, testing, specifications

Technological advancement in any branch of science and industry is dependent upon and limited by the adequacy of the tools and techniques available for measurement of the fundamental properties and constants of the materials involved. Thus, it is reassuring to note the growing emphasis upon and support of such work by the plastics industry.

Important contributions to our knowledge of the mechanical strength properties of nylon,^{326, 327} vinyl resins,³²⁸ cellulosic plastics,³²⁹⁻³³¹ phenolic and melamine molding materials,^{332, 333} and fabric-base laminates³³⁴ were published. Some thermal properties of styrene³³⁵ and acrylic³³⁶ polymers, optical properties of vinyl acetate,³³⁷ styrene,³³⁸ siloxane,³³⁹ and other polymers,³⁴⁰ and electrical properties of polyethylene³⁴¹ and phenolic materials³⁴² were investigated. Other reports dealt with the behavior of plastics with respect to dimensional stability,³⁴³ chemical^{344, 345} and weathering³⁴⁶ resistance, thermal expansion,³⁴⁷ and diffusion of water vapor³⁴⁸ and other gases.³⁴⁹

Evaluation of tensile,^{350, 351} flexural,^{352, 353} impact³⁵⁴⁻³⁵⁶ fatigue,³⁵⁷ and bursting³⁵⁸ strengths and abrasion resistance³⁵⁹⁻³⁶¹ of plastics is facilitated by methods and machines described by various authors. Theoretical and practical aspects of the permeability of plastics to water vapor³⁶²⁻³⁷¹ and other gases³⁷²⁻³⁷⁵ were discussed in an unusual number of reports on this subject. Other testing problems investigated pertained to electrical properties,^{376 377} flammability^{378, 379} and ignition temperature;³⁸⁰ blocking resistance,³⁸¹ greaseproofness,³⁸² and refractive index³⁸³ of films; low-temperature characteristics;³⁸⁴ specific gravity;³⁸⁵ and resistance to the aging effects of ultraviolet light³⁸⁶ and water.³⁸⁷⁻³⁸⁹

Analytical methods for polyglycols,³⁹⁰ carboxymethyl cellulose,³⁹¹ Vinsol resin,³⁹² double bonds,³⁹³ total solids

in solutions,³⁹⁴ and total volatiles in solids³⁹⁵ were reported. Some interesting identification procedures for resins^{396, 397} and plasticizers³⁹⁸ were outlined. The literature pertaining to special techniques for studying the properties of high polymers was augmented by articles concerning the ultracentrifuge,³⁹⁹⁻⁴⁰¹ ultrasonics,⁴⁰² electron microscopy,^{403, 404} light scattering,^{405, 406} viscosity,⁴⁰⁷ magnetic rotation,⁴⁰⁸ and electrometric analysis.⁴⁰⁹

The American Society for Testing Materials revised its specifications for laminated thermosetting materials and cellulose acetate and acetate butyrate molding compounds, and issued a specification for nonrigid polyvinyl tubing (D 922-47 T).⁴¹⁰ The Society adopted a test method for the determination of weight loss of plastics on heating (D 948-47 T) and a recommended practice for molding specimens of phenolic materials for use in electrical tests (D 949-47 T).⁴¹⁰⁻⁴¹¹ Committee D-14 on Adhesives⁴¹² has prepared eight methods of test as follows: method for determining tensile properties of adhesives (D 897-46 T); method for determining peel or stripping strength of adhesives (D 903-46 T); method for determining strength properties of adhesives in shear by compression loading (D 905-47 T); method for determining strength properties of adhesives in plywood type construction in shear by tension loading (D 906-47 T); method for determining the resistance of adhesive bonds to chemical reagents (D 896-46 T); recommended practice for determining the effect of artificial and natural light on the permanence of adhesives (D 904-46 T); method for determining the applied weight per unit area of dried adhesive solids (D 898-47 T); and method for determining the applied weight per unit area of liquid adhesives (D 899-47 T).

A review of methods and specifications for adhesives was issued in booklet form.⁴¹³ The British Standards Institution published a specification for aminoplastics.⁴¹⁴⁻⁴¹⁶ Classification systems for plastic materials⁴¹⁷ and their properties⁴¹⁸ were proposed.

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Materials

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12. "Chemistry and technology of the organic isocyanates," by S. H. Pinner, *Plastics (London)* 11, 206-211, 215 (Apr.); 270-280 (May 1947).
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17. "Pyrolysis of polytetrafluoroethylene," by E. E. Lewis and M. A. Naylor, *J. Am. Chem. Soc.* 69, 1968-1970 (Aug. 1947).
18. "Low polymers of chlorotrifluoroethylene," by W. T. Miller, Jr., R. L. Ehrenfeld, and M. Prober, *Ind. Eng. Chem.* 39, 333-337 (Mar. 1947).
19. "Polyethylene," *Chemical Industries* 60, 219-222 (Feb. 1947).
20. "What about silicone glass laminates?" *MODERN PLASTICS* 24, 184, 186, 188, 190, 192 (May 1947). (Please turn to page 186)

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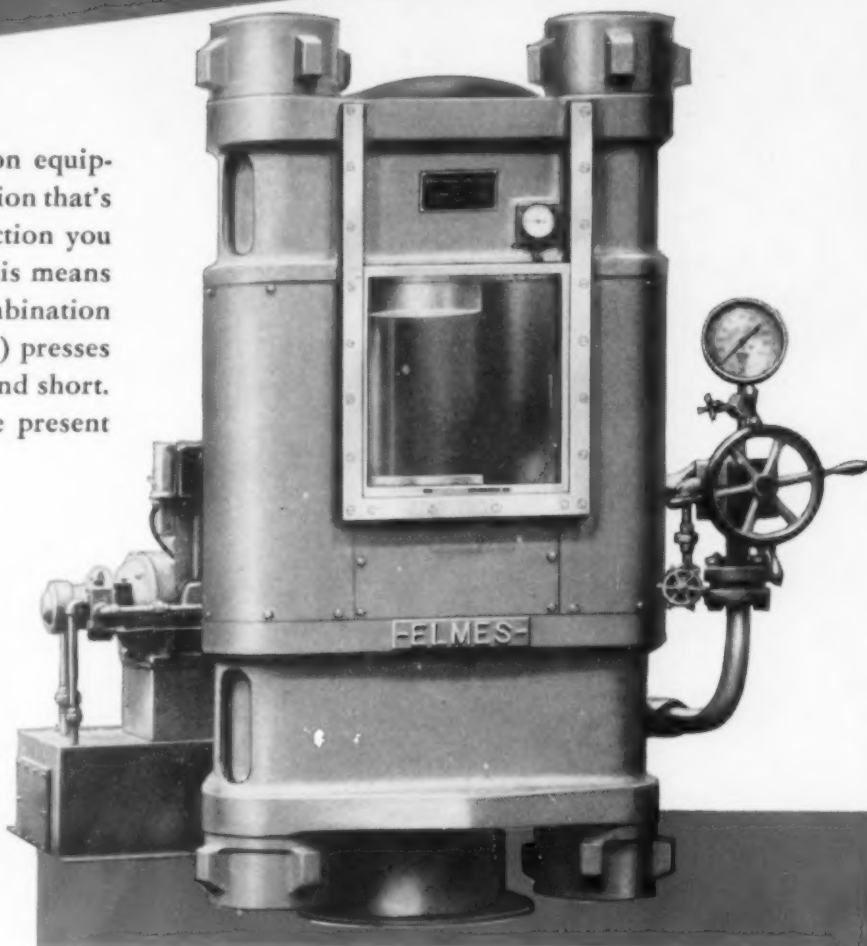
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Plastics Digest*

This digest includes each month the more important articles of interest to those who make or use plastics. Mail request for periodicals directly to publisher.

General

PLASTICS. G. M. Kline. *Ind. Eng. Chem.* 39, 1234-8 (Oct. 1947). Developments in the use of plastics for corrosion resistant equipment since the beginning of World War II are reviewed. The topics considered include polytetrafluoroethylene, styrene derivatives and copolymers, vinyl ester resins, polyvinylidene chloride, polyvinyl alcohol, polyvinyl carbazole, furane resin, silicon resins, resorcinol-formaldehyde resin, unsaturated esters, applications, and properties. Ninety-six references.

HARD RUBBER. F. S. Malm. *Ind. Eng. Chem.* 39, 1243-8 (Oct. 1947). Developments in the field of hard rubbers since the beginning of World War II are reviewed. Two hundred and seventy references.

LIGNIN, RESINS, AND CELLULOSE FEATURED BY PAPER ASSOCIATION. *Chem. Eng. News* 25, 2715 (Sept. 22, 1947). Brief abstracts of the talks given at the 1947 fall meeting on fundamental research of the Technical Association of the Pulp and Paper Industry are presented.

MOLDING FOR THE MILLIONS. *British Plastics* 19, 412-13 (Sept. 1947). A cast phenolic molding set for home workshop use is described.

FIBERS. R. S. Casey and C. S. Grove, Jr. *Ind. Eng. Chem.* 39, 1213-15 (Oct. 1947). Developments in the field of fibers since the beginning of World War II are reviewed. Forty references.

Materials

RUBBERLIKE PRODUCTS FROM LINEAR POLYESTERS. B. S. Biggs, R. H. Erickson and C. S. Fuller. *Ind. Eng. Chem.* 39, 1090-7 (Sept. 1947). The polymers which result from the condensation of dibasic acids with propylene glycol are viscous gums which can be vulcanized to rubberlike products. In the unpigmented condition these rubbers are quite weak, but when reinforced with suitable pigments their strength and elongation compare favorably with other synthetic rubber. Because polyesters of known structure and molecular weight can be easily synthesized, these polymers are useful for the study of the relations be-

tween structure and properties in rubberlike materials in general. Factors affecting tensile strength, oil resistance, brittle temperature, and stability are discussed.

PREPARATION AND POLYMERIZATION OF *p*-N, N-DIMETHYLSULFONAMIDOSTYRENE. G. E. Inskeep and R. Deanin. *J. Am. Chem. Soc.* 69, 2237-8 (Sept. 1947). *p*-N, N-Dimethylsulfonamidostyrene was prepared, polymerized and copolymerized with butadiene. The polymer has a softening point of 190 to 210° C., is insoluble in acetone, amyl acetate and benzene, is soluble in chloroform, has a density of 1.25 g./cm.³, and has a molecular weight of 20,900.

TERYLENE—THE NEW SYNTHETIC FIBER. K. Turner. *Textile Recorder* 64, No. 765, 36-7 (1946). A new synthetic fiber made of ethylene glycol and terephthalic acid is described.

STRUCTURE OF TERYLENE. D. V. N. Hardy and W. A. Wood. *Nature* 159, 673-4 (1947). The structure of polyethylene terephthalate was investigated by X-ray technique.

Molding and fabricating

HEAT SEALING ACETATE. W. F. Cullom. *Modern Packaging* 21, 152-3, 202 (Sept. 1947). Devices suitable for heat-sealing cellulose acetate plastic film to itself and to paper are described. On one device, the sealing surfaces are covered with polytetrafluoroethylene to keep them from sticking to the plastic. In another these surfaces are covered with mica. Conventional rotary and jaw-type sealers and hand irons have also been used.

Applications

PLASTICS IN PHOTOGRAPHY. T. T. Baker. *American Photography* 41, 14-15 (Jan. 1947). The properties of a material must have to replace gelatin in photographic films are discussed. Cellulose acetate with an acetyl content between 20 and 28% has been used experimentally. Probably the best plastic found to date for this purpose is polyvinyl alcohol. The method of preparing a photographic emulsion from polyvinyl alcohol is described.

LAMINATES FOR CARRIAGE INTERIORS. *British Plastics* 19, 402-5

(Sept. 1947). Applications of laminated plastics in the construction of railway passenger cars are described. These applications include interior paneling and table tops. Hand rails of cellulose acetate plastic, nylon curtains and fabric coated with polyvinyl chloride for blinds are also used in the passenger cars.

ROYAL CARS FITTED WITH ACRYLIC ROOF PANELS. *British Plastics* 19, 415 (Sept. 1947). The motor cars used by the King of England are equipped with roof panels made of transparent methyl methacrylate sheet.

PLASTICS AS LIVING MATERIALS. G. H. Friese-Greene. *Plastics (London)* 11, 341-9 (July 1947). The design and execution of art objects, lamps, cases, goblets, and chessmen from plastics, particularly transparent ones, are described here.

Coatings

BUTYRATE HOT-MELT COATINGS. M. Salo. *Modern Packaging* 20, 127-8, 166, 168 (Aug. 1947). Cellulose acetate butyrate hot-melt coatings are applied to packaging materials by a continuous solventless high-speed process. The mixture consists of a low-viscosity, high-butyryl cellulose acetate butyrate, plasticizers, resin, and waxes. A typical composition contains 40 to 60% cellulose acetate butyrate, 15 to 25% plasticizer, 10 to 30% wax-blending resin and 1 to 5% wax. The properties of various types of papers coated with these compositions are reported. The flexibility, impact strength, appearance, water resistance, and blocking temperature are outstanding.

DEVELOPMENTS IN CELLULOSE LACQUERS. R. J. Ledwith. *J. Oil & Colour Chem. Assoc.* 29, 214-21 (1946). The effect of various oil-modified alkyds in cellulose nitrate lacquers on the properties of the products was investigated. Hot spray and record lacquers are discussed in this article.

IMPACT OF NEW LINEAR POLYMERS IN THE FIELD OF SURFACE-PROTECTIVE COATINGS. J. S. Gourlay. *Paint Manuf.* 16, 364-7, 398-400 (1946). The properties of hydrocarbon resins and the polyvinyl chloride acetate copolymers are reviewed from the viewpoint of replacement of older materials in organic coatings.

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Technical Briefs

Abstracts of articles on plastics in the world's scientific and engineering literature relating to properties and testing methods, or indicating significant trends and developments.

Engineering

MELAMINE RESIN COLLOIDS AND WET-STRENGTH PAPER PRODUCTION. B. Steenberg. *Svensk Papperstidn.* 49, 311-23 (1946); *Chem. Abstracts* 40, 7623-4 (Nov. 20, 1946). The mechanism of imparting high wet strength to paper by introducing trimethylolmelamine resin in colloid suspensions during the papermaking process was investigated thoroughly. The resin colloid is positively charged. The reaction between the resin colloid and the fiber is rapid and irreversible. The amount of absorbed resin increases with higher concentration of resin, higher concentrations of hydroxyl ions, increased beating and increased polar groups in the fibers. The composition of the white water affects the results. Maximum wet strength is not obtained until the resin is cured. Possible mechanisms of wet strength are discussed.

TEMPERATURE DISTRIBUTION IN WHITE-OAK LAMINATED TIMBERS HEATED IN A HIGH-FREQUENCY ELECTRIC FIELD. M. E. Dunlap and E. R. Bell. *Trans. A.S.M.E.* 69, 509-18 (July 1947). High-frequency dielectric heating is applied to the process of laminating commercial white-oak ship timbers. Specimens composed of eight laminations were heated, both with and without glue, to study the temperatures existing in the glue-line areas. The uniformity of temperature depends upon the density, moisture content, arrangement of the laminations, direction of the electric field and thermal insulation of the heated material. The effect of these variables is greater when the electric field and glue lines are parallel than when they are mutually perpendicular. Thermocouples were used for rapid temperature measurement. A method of heating the sides of timbers effectively was developed. A resorcinol-formaldehyde resin adhesive was used.

Chemistry

KINETICS OF CURE OF RESOL RESINS. M. N. Fineman and I. E. Puddington. *Ind. Eng. Chem.* 39, 1288-93 (Oct. 1947). The rate and extent of cross bonding in phenol-formaldehyde casting resins of varying composition were determined by measuring changes in their electrical resistance and density during the process of cure. The electrical measurements are apparently sensitive to

changes in the internal molecular arrangement of these systems while the density determinations are mainly characteristic of their macro properties. The increased rate of cure due to accelerators and retarding effect of plasticizers are indicated experimentally by the results obtained. The procedures are useful for studying the kinetics of cure of these complex systems.

DETERMINATION OF THE MOLECULAR WEIGHT OF NYLON. J. E. Waltz and G. B. Taylor. *Ind. Eng. Chem. Anal. Ed.* 19, 448-50 (July 1947). Methods for the determination of the molecular weight of nylons are described. The active end groups of alcohol-soluble nylons are determined either potentiometrically or conductometrically. The amine end groups of alcohol-insoluble, phenol-soluble nylons may be determined by conductometric titration in the solvent phenol-alcohol-water. The carboxyl end groups of the latter nylons are determined by dissolving the polymer in benzyl alcohol at 175° C. and titrating with potassium hydroxide, using phenolphthalein as indicator.

Properties

PERMEABILITY OF DIFFERENT RUBBERS TO GASES AND ITS RELATION TO DIFFUSIVITY AND SOLUBILITY. G. J. van Amerongen. *J. Applied Phys.* 17, 972-85 (1946). The permeability of natural and various synthetic rubbers to hydrogen, oxygen, nitrogen, carbon dioxide, methane, ammonia, sulfur dioxide, and helium were determined at five temperatures between 17 and 50° C. Differences in permeability are caused by differences in solubility and rates of diffusion. The log of the solubilities of different gases in natural rubber increases linearly with their critical temperatures. Polar groups in an elastomer reduce the solubility of nonpolar gases and increase the solubility of polar gases. The greater the diameter of the gaseous molecule the lower the rate of diffusion and the higher the activation energy of diffusion. Polar and methyl groups in elastomers produce low rates of diffusion.

Testing

DETERMINATION OF SOLIDS IN RESIN SOLUTIONS. J. H. Vail. *Ind. Eng. Chem., Anal. Ed.* 19, 412-13 (June 1947). Total solids in resin solutions can be determined by heating 0.1 gram samples

in a convection oven for 10 to 20 min. at 105 to 135° C. The results expressed as percent total solids have a precision of about 0.4 percent and differ by only 0.1 percent from those determined by the A.S.T.M. procedure (3 hr. at 105° C.).

DETERMINATION OF TOTAL VOLATILES IN SMOKELESS POWDER. W. E. Shafer, R. T. Hall, J. C. French and W. W. Becker. *Ind. Eng. Chem. Anal. Ed.* 19, 378-81 (June 1947). In the manufacture of solvent types of smokeless powder, small amounts of volatiles (ether, alcohol and water) remain in the finished powder. These volatiles may be determined accurately by dissolving 2-gram samples in dibutyl phthalate by overnight agitation at 85° C., after which the samples are evacuated for 2 hr. at a pressure of 5 mm., and the loss in weight of the system is then measured. In the analysis of certain types of smokeless powder, it is necessary to dissolve the samples in an atmosphere of nitrogen to avoid oxidation and to add more stabilizer to prevent decomposition. The method appears to be applicable to the determination of any readily volatile substance in admixture with any nonvolatile heat-stable material soluble in a nonvolatile high-boiling solvent.

Synthetic rubber

EFFECT OF FUNGICIDES ON NATURAL AND SYNTHETIC RUBBER. J. L. Stief, Jr., and J. J. Boyle. *Ind. Eng. Chem.* 39, 1136-8 (Sept. 1947). Military operations in tropical regions necessitate treatment for the protection from fungus attack of cotton cloth used in fabrics coated with synthetic rubber. This paper describes the effect of several common fungicides on the physical properties of natural and synthetic rubbers. Soil burial tests indicated that natural rubber, GR-S, and neoprene exhibited no significant loss of strength due to fungus attack, so that a fungicide was not considered necessary for the protection of the vulcanizate itself. Pyridyl mercuric stearate, salicylanilide, pentachlorophenol, and 2,2'-methylene-bis(4-chlorophenol) caused little or no adverse effect when incorporated directly into these three types of rubber before curing. However, copper naphthenate had a slight weakening effect on neoprene, a somewhat greater weakening effect on natural rubber, particularly after aging, and a marked weakening effect on GR-S.



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U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25 cents each.

COPOLYMERS. H. L. Gerhart (to Pittsburgh Plate Glass Co.). U. S. 2,424,814, July 29. A hard plasticized styrene-maleic anhydride body is prepared by placing a mixture of maleic anhydride and styrene together with a plasticizer such as methyl levulinate, acetophenone, diacetone alcohol, or mesityl oxide in a mold and polymerizing.

COPOLYMERS. E. W. Moffett and R. E. Smith (to Pittsburgh Plate Glass Co.). U. S. 2,424,838, July 29. An artificial resin comprising the copolymerizate of a monocarboxylic acid ester of allyl alcohol and a vinyl ester.

IMPREGNATED FABRIC. H. Snow (to Southern Friction Materials Co.). U. S. 2,424,861, July 29. A flexible water and wear-resistant leather substitute is prepared by impregnating and coating a woven textile fabric with a varnish of an oil-modified thermosetting resin, curing said resin, and treating the surface by abrading in order to remove the crust which is formed.

SHOE UPPER. W. H. Wedger (to United Shoe Machinery Corp.). U. S. 2,424,869, July 29. A shoe upper ready to be conformed to a last, a selected portion of which has incorporated therein a stiffener comprising an aminoplast in a liquid vehicle, a finely divided inert filler and a curing agent.

MODIFIED RESINS. J. M. Buist, J. G. Cook, B. J. Habgood, D. A. Harper, R. J. W. Reynolds, W. F. Smith, and G. N. Welding (to Imperial Chemical Industries, Ltd.). U. S. 2,424,883-5, July 29. A process comprising intimately mixing a diisocyanate modified polymer with paraformaldehyde, heating at 100 to 150° C. for less than 1 hr. until the product exhibits increased resilience and increased softening point, said polymer being a soft, waxy, low molecular weight polymerizate of a material such as carboxylic acid ester polymer or an amide-polyester.

CHLORINATED RUBBER. H. E. Albert and R. J. Reid (to Firestone Tire and Rubber Co.). U. S. 2,424,920, July 29. The process comprising injecting chlorine for from 4 to 36 hr. into an aqueous suspension of a granular, porous, solution-chlorinated rubber obtained by chlorinating rubber in solution in an organic solvent, the temperature being maintained between 70 and 95° C.

LAMINATE. K. L. Edgar, F. W. Stavely, and C. K. Novotny (to Firestone Tire and Rubber Co.). U. S. 2,424,923, July 29. An uncured fibrous lamina adapted for plying and curing to form a structural laminate, comprising a fibrous web impregnated and coated with a number of superposed coatings of binding material, certain of said coatings comprising urea-formaldehyde and a butadiene-styrene copolymer and others comprising urea-formaldehyde and a curing agent therefor.

COATINGS. P. White (to T and T Vicars, Ltd.). U. S. 2,424,949, July 29. A method of applying a layer of plastic material to an article consisting in taking up said plastic in the confines of an opening in a stencil plate and then progressively applying fluid pressure to the wad confined within said opening from one side to the other to eject progressively the wad from the stencil while confining the remainder of the wad in the stencil.

ROSIN POLYMER. B. L. Hampton (to Glidden Co.). U. S. 2,424,979, Aug. 5. Rosin is polymerized by treating in the liquid phase with a small amount of a catalytic material such as a mercury halide for 0.5 to 100 hr. at temperatures between 50 and 165° C.

POLYSULFIDE POLYMERS. J. C. Patrick (to Thiokol Corp.). U. S. 2,425,045, Aug. 5. The process comprising heating a linear polysulfide polymer to a temperature of 100 to 200° C., stretching under tension and cooling to a temperature less than 100° C. while maintaining it under tension, said polymer being characterized by a predominance of —SS— linkages alternating with intervening organic groups.

ORIENTED POLYMERS. G. F. D'Alelio (to Pro-phy-lac-tic Brush Co.). U. S. 2,425,086, Aug. 5. A cold drawn article such as a sheet, fiber, or the like which exhibits a characteristic crystalline X-ray diffraction pattern comprising a polymerizate of a mixture of butadiene-1,3, acrylonitrile, and a vinyl ether.

POLYMERS. E. L. Kropa (to American Cyanamid Co.). U. S. 2,425,191-2, Aug. 5. A process comprising polymerizing vinyl acetate or an alkyl ester of acrylic acid in which the alkyl group contains from one to four carbon atoms in at least 65% solution of zinc chloride in water.

SYNTHETIC FILAMENTS. D. McCreath (to Imperial Chemical Industries, Ltd.). U. S. 2,425,334, Aug. 12. Synthetic linear polyamide articles in the form of filaments, bristles, yarn, and the like are modified by impregnating undrawn articles with an aqueous solution having a pH of not greater than 3.0 and having dissolved therein formaldehyde, a catalyst such as an acid having an ionization constant of at least 1.0×10^{-2} at 25° C., removing the surface liquid and baking at a temperature of 100 to 150° C.

BONDING MATERIAL. H. E. Schroeder (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,425,348-9, Aug. 12. A composition for bonding textile materials to rubbery polymers comprising a blend of a cyclized rubber obtained by heating a solution of a rubber with a small portion of sulfuric acid and a small portion of phenol and a heat convertible resinous reaction product of resorcinol and formaldehyde.

CELLULOSE ETHERS. J. H. Sharp-house and J. Downing (to British Celanese, Ltd.). U. S. 2,425,351, Aug. 12. A cellulose ether composition comprising an ethyl cellulose and N,N'-di- β -naphthyl-paraphenylenediamine.

EMULSIONS. J. I. Crabtree and G. T. Eaton (to Eastman Kodak Co.). U. S. 2,425,363, Aug. 12. The process of rapidly fixing a photographic element which includes a non-gelatin layer such as a cellulose ester comprising immersing in a bath containing a water-soluble thiocyanate or thiourea.

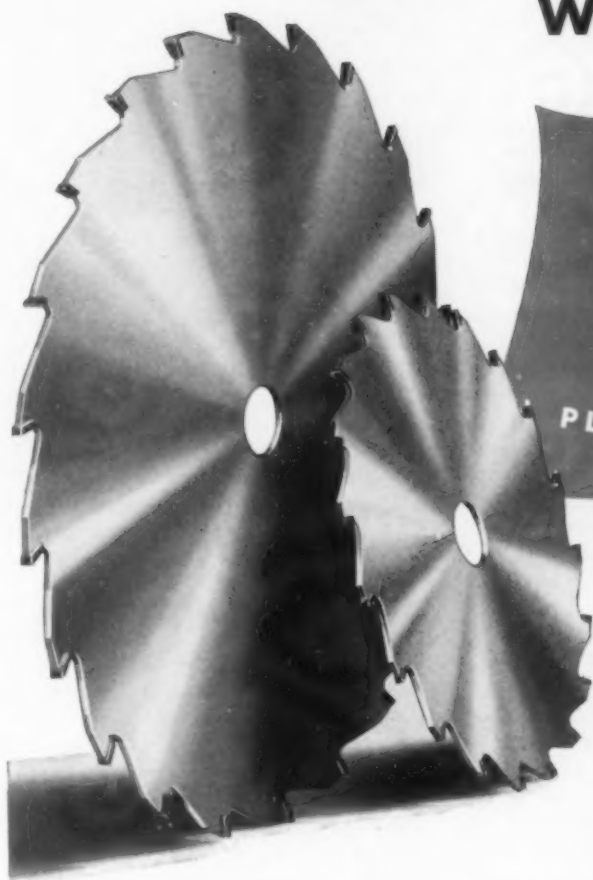
ELECTRIC TERMINAL. J. Touborg. U. S. 2,425,404, Aug. 12. An electrical terminal assembly containing a plastic non-conductive bushing.

LAMINATES. J. Young (to Dura-mold Aircraft Corp.). U. S. 2,425,450, Aug. 12. A device for fabricating an assembly of molded wood and the like comprising a rigid die having spaced forming surfaces against which the structure may be pressed, said space being adapted to contain material to be adhered to structure on the forming surfaces; a pressure fluid-responsive member in the space between said surfaces, said member having a movable wall for engaging the material contained therein and to exert pressure through the material against the forming surfaces and

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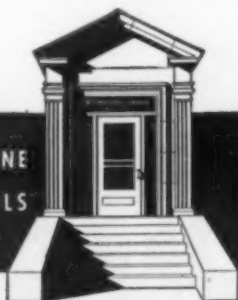
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POLYSTYRENE. F. E. Wiley (to Plax Corp.). U. S. 2,425,501, Aug. 12. The process of preventing crazing of a flash-heated shape of polystyrene comprising heating said shape at a temperature of 194 to 221° F., immediately flash-heating the shape by drawing through a die heated to 580 to 600° F. and thereafter immediately quenching.

MOLDED BOATS. D. M. Blakely. U. S. 2,425,507, Aug. 12. Boats of various sizes are molded from a single hull mold of the longest length and widest beam by establishing diverging buttock lines from a point established at the intersection of the keel line extended to the sternmost point of the transom to sheer points located at a radius equal to the length of the hull to be molded from said intersection of the keel line extended with the sternmost point of the transom, molding a fragmentary hull in two halves outside said diverging buttock lines, assembling said hull sections onto a keel and ribs in the usual manner with the buttock lines adjacent the keel and forming a suitable transom at the stern to which the rear end of the molded and assembled hull sections are joined.

SHEATHED CABLE. G. Haim and H. P. Zade (to Arc Manufacturing Co., Ltd.). U. S. 2,425,528, Aug. 12. A terminal joint is made on an insulated and sheathed cable in which the conductors are bedded in insulating material made of plastic and in which the cable has an outer sheath of a plastic which comprises exposing end portions of the conductors, flaring the sheaths radially, threading a washer of thermoplastic insulating material onto the conductors, coating the bared wires contiguous to the insulation and to the washer with a fluid polymerizable material at the temperature attained by those parts during the subsequent electric heating of the terminal and welding by means of diathermy.

PROTEIN PRODUCTS. H. P. Lundgren (to U. S.). U. S. 2,425,550, Aug. 12. Thin fibers and films are manufactured from a protein by treating the protein in aqueous solution with a detergent such as an alkyl aryl or alkyl sulfate whereby molecules of the detergent attach to the protein molecules, adding a neutral salt to the resulting solution to precipitate the protein and deforming the precipitate into a thin article, treating with a solvent such as aqueous acetone or aqueous alcohol to split the detergent-protein complex and recovering the resulting article.

SAFETY GLASS. J. D. Ryan and F. B. Shaw, Jr. (to Libbey-Owens-Ford Glass Co.). U. S. 2,425,568, Aug. 12. Laminated glass comprising two sheets of glass and an interlayer of plastic material

composed of a polyvinyl ketal acetal resin made by reacting a partially or wholly hydrolyzed polyvinyl acetate with methyl ethyl ketone and butyraldehyde.

DOOR KNOB. F. E. Frost and E. A. Pavlis. U. S. 2,425,611, Aug. 12. A door knob composed of plastic material.

ETHYLENE POLYMERS. M. D. Peterson (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,425,638, Aug. 12. In a continuous process for homopolymerizing ethylene at a pressure above 1000 atmospheres, the steps comprising passing ethylene with a dialkyl dioxide into a reaction zone of relatively great length with respect to diameter, conducting the reaction at a temperature between 205 and 300° C. and with a contact time of not more than 30 minutes.

POLYMERIZATION. C. E. Barnes (to General Aniline and Film Corp.). U. S. 2,425,666, Aug. 12. In casting by polymerization, the method of maintaining the volume of material being polymerized substantially constant during the reaction by raising the temperature as it densifies, to cause thermal expansion so that the expansion slightly exceeds polymerization shrinkage.

VARNISHES. H. S. Rothrock (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,425,756, Aug. 19. A varnish is prepared by partially esterifying a polyhydric alcohol with an esterifiable β -furylacrylic acid or the anhydride, chloride, or monoalcoholic esters thereof, further esterifying the polyhydric alcohol with an acidic natural resin, heating the mixed ester with a natural fatty oil adding a varnish solvent.

SHEET MATERIAL. C. A. Scogland (to Studebaker Corp.). U. S. 2,426,058, Aug. 19. A ribbed and laminated plastic sheet comprising outer layers of plastic impregnated sheet material and an intermediate layer of similar material positioned therebetween, and having slits therein and deformable cores threaded through the slits in said intermediate layer.

BLAST CLEANING. W. C. Wall and G. A. Wilkens (to E. I. du Pont de Nemours & Co. Inc.). U. S. 2,426,072, Aug. 19. The method of blast cleaning a surface comprising projecting solid particles of polymethyl methacrylate resin at high velocities against said surface.

POLYVINYL CHLORIDE. J. Chapman and J. W. C. Crawford (to Imperial Chemical Industries, Ltd.). U. S. 2,426,080, Aug. 19. In the manufacture of chlorinated polyvinyl chloride, the steps comprising adding water and polyvinyl chloride to an organic solvent therefor to form a solution of polyvinyl chloride and passing chlorine into said solution at a temperature between 80 and 120° C.

HARD POLYMERS. W. Mertens (to U. S.). U. S. 2,426,111, Aug. 19. Solid electrically insulating articles are prepared by forming a homogeneous mixture of polyisobutylene with monomeric styrene and divinylbenzene together with a catalyst, heating to polymerize the monomers thereby obtaining a prehardened material, subjecting to a kneading treatment to soften the material and subjecting the softened material to another heat treatment at a temperature of 130° C. to reharden the material.

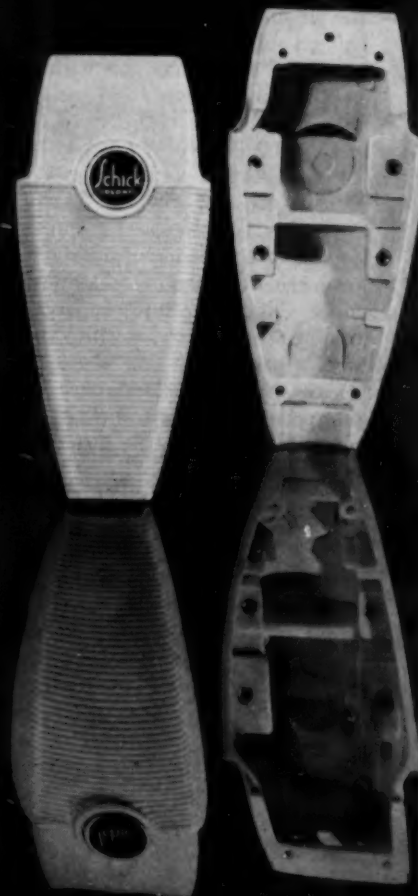
TRIMETHYLOLNITROMETHANE. W. W. Trowell (to Hercules Powder Co.). U. S. 2,426,128, Aug. 19. A method of hardening comprising treating a formaldehyde-hardenable material with trimethylolnitromethane, shaping the composition, and thereafter heating to bring about decomposition of the trimethylolnitromethane and harden the material by reaction of the formaldehyde liberated.

PRESSURE SENSITIVE TAPE. P. F. Ziegler (to Kendall Co.). U. S. 2,426,257, Aug. 26. An adhesive tape comprising a flexible sheet backing having on one side thereof a pressure sensitive adhesive comprising a normally solid aromatic sulfonamide-formaldehyde resin, cellulose acetal and a non-volatile liquid toluene sulfonamide plasticizer compatible with both resin and cellulose acetal.

SHOE SOLE ATTACHMENT. G. T. Hart (to United Shoe Machinery Corp.). U. S. 2,426,268, Aug. 26. The method of sole attachment on welt shoes, comprising securing an inner electrode on the shoe bottom near the inner face of the inseam, laying the sole on the shoe with a marginal band of unactivated thermoactive cement therebetween, providing marginal compacting pressure to the sole and welt positioning an outer electrode about the shoe, activating the cement by means of a high frequency field between the electrodes, and removing pressure after the cement has set.

WATERPROOFING. S. M. Edelstein. U. S. 2,426,300, Aug. 26. A water repellent coating composition for textiles and the like comprising cellulose dissolved in an aqueous solution of sodium zincate containing an excess of sodium hydroxide and, emulsified therein, a waterproof wax, a water-soluble emulsifying agent and water, said composition undergoing precipitation of the cellulose and wax on acidification.

VINYL RESIN COMPOSITIONS. F. S. Martin (to U. S. Rubber Co.). U. S. 2,426,316, Aug. 26. An improved vinyl-acetate vinyl-chloride copolymer resin composition comprising a plasticizer and a factice, the latter being effective to increase resistance to shrinkage and cracking. (Please turn to the next page)



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INTERPOLYMERS. P. O. Tawney, (to U. S. Rubber Co.). U. S. 2,426,325, Aug. 26. Soluble, fusible terpolymers of an unsaturated ether such as diallyl ether, methyl methacrylate, and an unsaturated dicarboxylic ester such as diethyl fumarate or *n*-butyl acid maleate.

COATING. R. C. Swain and P. Adams (to American Cyanamid Co.). U. S. 2,426,379, Aug. 26. A coating composition comprising an emulsion of melamine-formaldehyde resin prepared by reacting one mol of melamine with six mols of formalin and reacting the condensate with butanol, cellulose acetate and a fatty-oil-modified phthalic-glyceride resin.

CAST POLYMERIZATION. J. K. Magrane, A. R. Esterly, and R. E. Davies (to Catalin Corp. of America). U. S. 2,426,402, Aug. 26. In cast polymerizing without crazing, the method comprising forming an intimate mixture of diallyl phthalate, an acrylic ester, an organic peroxide, and a parting agent, casting the mixture into a mold, warming to between 55 and 70° C., continuing to warm until the mixture is polymerized through the soft gel stage and then raising the temperature and completing polymerization at a temperature between 70 and 80° C.

INSULATION. W. F. O. Pollet (to W. T. Henley's Telegraph Works Co., Ltd.). U. S. 2,426,413, Aug. 26. An insulated conductor is prepared by applying to a conductor a covering of a polyvinyl compound such as polyvinyl chloride or a polyvinyl chloride-acetate copolymer containing a plasticizer, wetting the surface with a paste consisting of ungelled powdered polyvinyl chloride dispersed in a non-volatile plasticizing liquid, applying a textile covering to the surface and heating to fuse the paste.

BRAKE ASSEMBLY. S. G. Tilden, F. D. Snell, and J. M. Fain (to Foster D. Snell, Inc.). U. S. 2,426,421, Aug. 26. A binder for holding a brake lining to a brake shoe comprising a resinous sheet including a thermosetting resinous condensate which is yieldable after setting, a surface tension lowering agent, a plasticizer, and a thin, non-resinous sheet disposed within the resinous sheet and serving as a skeletonizing sheet.

PLASTIC MACHINE. A. K. F. Koch. U. S. 2,426,457, Aug. 26. A machine for feeding plastic material.

COATING. C. B. Large, M. J. Zucrow, and R. L. Hirsch (to Aerojet Engineering Corp.). U. S. 2,425,512, Aug. 26. A lacquer of chlorinated natural rubber, chloropropane wax, and hexachlorobutadiene dissolved in carbon tetrachloride.

DIELECTRIC MATERIALS. F. B. Hogdon (to Western Electric Co., Inc.).

U. S. 2,426,609, Sept. 2. A condenser dielectric is prepared by coating a thixotropic suspension of an alkali earth titanate in alcohol on a film of polystyrene, drying the coating partially, calendering the partially dried film, and drying.

INJECTION MOLDING. T. F. Stacy (to French Oil Mill Machinery Co.). U. S. 2,426,651, Sept. 2. A method for injection molding a heat hardenable resinous material and device therefor.

SHOE MANUFACTURE. J. J. Brophy (to United Shoe Machinery Corp.). U. S. 2,426,666, Sept. 2. A shoe comprising an upper, an insole, an outsole, and a welt composed of plastic material, said outsole having pegs of plastic material compatible with that of the welt secured in its inner margin, the inner ends of said pegs being bonded to the welt.

ACRYLONITRILE YARN. W. W. Watkins (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,426,719, Sept. 2. Acrylonitrile polymer yarn is wet spun by extruding a solution of the polymer in dimethylformamide through a shaped orifice into a glycerol spinning bath.

ACRYLONITRILE COPOLYMERS. G. F. D'Alelio (to Pro-phy-lac-tic Brush Co.). U. S. 2,426,728, Sept. 2. A cold-drawn molecularly oriented article showing characteristic crystalline X-ray diffraction, comprising a copolymerizate of a mixture of acrylonitrile, an ethylene α , β -dicarboxylic acid diester of a saturated monohydric alcohol, and an ester of acrylic acid.

BOAT CONSTRUCTION. H. M. Davidson. U. S. 2,426,729, Sept. 2. A boat hull is constructed by covering a mold shaped to conform to the hull shape with inner, intermediate, and outer plies of strip material, the inner ply extending longitudinally, the intermediate ply being applied together with an adhesive diagonally to the inner ply, covering with an airtight flexible cover, exhausting air, and setting the adhesive, removing from the mold, coating with adhesive and applying an outer ply, and repeating bag-molding.

TEXTILE FINISHING. J. M. Grim (to American Cyanamid Co.). U. S. 2,426,770, Sept. 2. A textile finishing composition an aqueous solution of a water-soluble methoxy-methyl melamine containing at least two methoxy-methyl groups, said solution having dispersed therein an aliphatic alcohol having at least eight carbon atoms.

SHEET MATERIAL. F. A. Lang (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,426,775, Sept. 2. Sheeted heat-curable plastic material is cured by passing through a heating chamber in proximity to a surface heated

above the curing temperature of the material, removing the material from said chamber prior to substantial curing thereof, gathering into a compact form in a curing chamber, said compact form comprising a bundle of layers, each with a separator between itself and each adjacent layer, and cooling.

INSULATED CONDUCTOR. S. E. Brillhart and A. N. Gray (to Western Electric Co., Inc.). U. S. 2,426,858, Sept. 2. An insulated conductor comprising a conductor, a layer of insulation, a layer of textile impregnated with plastic material comprising a mixture of unconverted ester gum and a semi-drying oil, a coating of unconverted ester gum, blown soybean oil and a pigment, and an outer coating of colored cellulosic lacquer.

BUBBLE PIPE. A. E. Neumann. U. S. 2,426,895, Sept. 2. A plastic pipe for blowing bubbles and simultaneously emitting a whistle.

ARTIFICIAL BRISTLES. H. A. Neville and T. G. Harris (to Devoe and Reynolds Co., Inc.). U. S. 2,426,896, Sept. 2. A continuous process for making tapered bristles comprising the steps of passing a number of continuous core filaments into and out of a coating bath of plastic material which is sufficiently viscous to cling to the filaments to form coatings of substantial thickness and not to run substantially on the filaments, intermittently varying the speed of withdrawal from the bath, and hardening the coated filaments under tension.

POLYSULFIDES. N. F. Barr and W. K. Schneider (to Stoner-Mudge, Inc.). U. S. 2,426,916-7, Sept. 2. An aqueous dispersion of a polyalkylene polysulfide is treated with a water-soluble ionizable phosphate or ammonium cation to reduce the permeability of films thereof to water.

CELLULOSE ESTERS. A. D. Clark and W. F. Reichert (to American Viscose Corp.). U. S. 2,426,982, Sept. 9. In the production of cellulose esters, the method of maintaining the solution at a temperature not substantially in excess of 30° C. during the anhydride conversion and ester hydrolysis which comprises adding ice to the acylation solution in an amount sufficient to convert all of the anhydride to acid and reduce the concentration of the total acid present to about 95% with respect to water.

UNSATURATED POLYESTERS. C. J. Frosch (to Bell Telephone Laboratories, Inc.). U. S. 2,426,994, Sept. 9. A sulfur-cured dihydroxyalkane-dicarboxyalkane-dicarboxyolefin polyester, the said polyester prior to curing containing 3 to 13 olefinic double bonds per 400 atoms in the ester chain.

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1817. Pouring spout with fit closures, 63, 68 mm. (fits standard Mason jar).

1818. Road marker, used as driveway markers and to protect newly painted lines. This marker is a 5-in. pyramid.

1819. Whistle, army-navy regulation.

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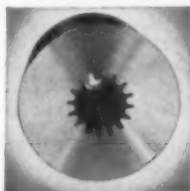
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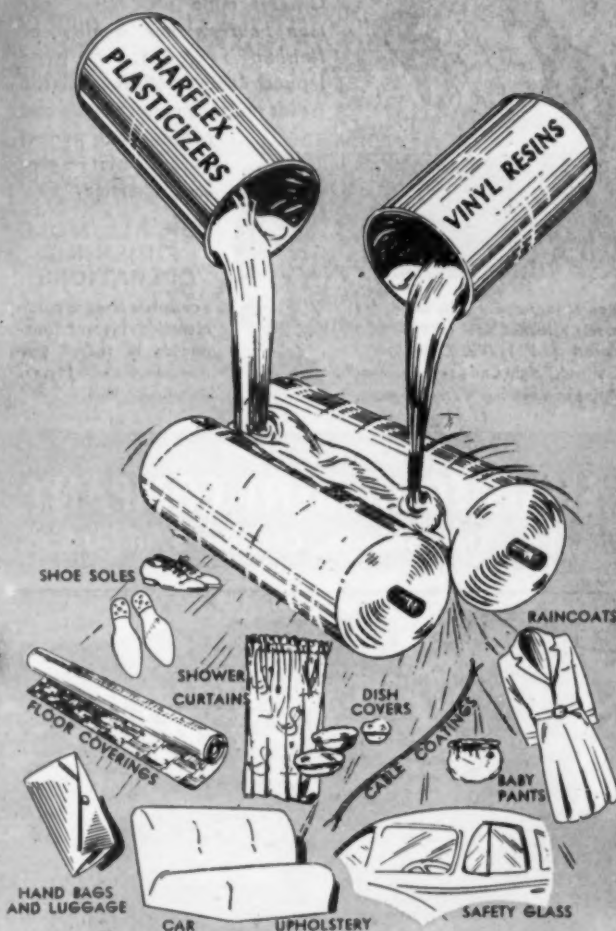


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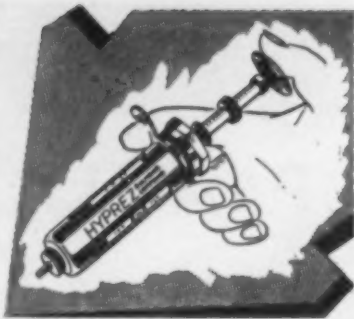
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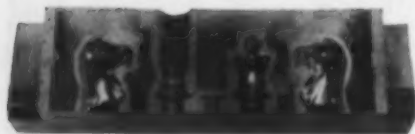
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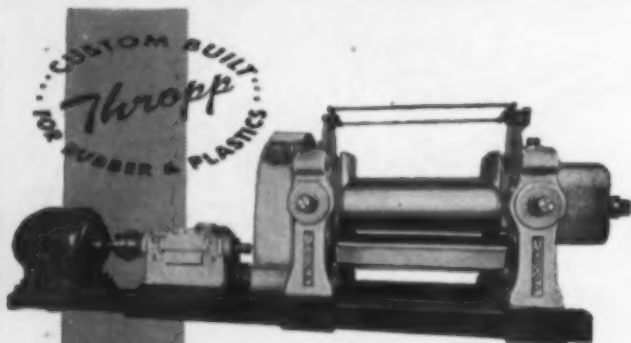


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* Patent pending.

*Outer shell and handles are molded in one
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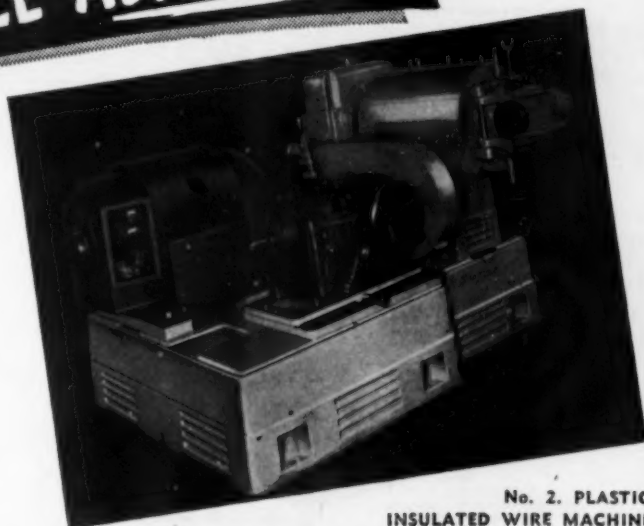
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A SLIDE fastener which can be permanently bonded to vinyl sheeting or film by electronic heat sealing has been developed by Waldes Kohinoor, Inc., Long Island City, N. Y.

Slide fasteners have long been accepted as the ideal closure for vinyl garment bags, cosmetic kits, etc., but they have always been stitched to the vinyl. Many manufacturers feel that the needle holes lower the tear resistance of the vinyl and thus shorten the life of the end product.

To eliminate the necessity of stitches, Waldes Kohinoor experimented with various methods to develop a slide fastener which could be bonded to vinyl on standard electronic heat sealing equipment. Attempts to replace the cotton tape of the zipper with a vinyl tape failed because the elasticity of the vinyl affected the spacing between the teeth of the zipper, causing frequent malfunctioning.

Metal or nylon teeth

The company finally developed a special process for treating the cotton tape so that it can be bonded to vinyl. The exact nature of the process is a company secret; a patent has been applied for.

The Seal-Zip, as the new closure is called, is available with metal teeth for standard applications such as the cosmetic bag illustrated, which is made by Electronic Sealing Co., Brooklyn, N. Y. For applications where more decorative zippers or rust-proof qualities are desired, Waldes offers slide fasteners with nylon teeth in brilliant colors which can be used to match or contrast with the vinyl material.

These zippers with specially treated cotton tape are electronically heat-sealed to vinyl





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Acoustical board

A LOW COST suspended ceiling comprising an acoustical board of specially processed glass fibers treated with a phenol-formaldehyde resin has been announced by Owens-Corning Fiberglas Corp., Toledo 1, Ohio, for use with recessed-type fluorescent light troffers.

Besides its attractive appearance, the Fiberglas board has other advantages—high sound-absorbing properties and light reflection, non-combustibility, low moisture absorption. Designed for both new construction work and remodeling, this board is simply laid between continuous troffer rows, spanning 24 in. without sag or cross support. It is 1 in. thick and available in sizes 25½ by 48 in. and 24 by 48 inches. Weight is 0.75 lb. per sq. ft., and light reflection coefficient is 0.75 to 0.80.

For high light reflection and attractive appearance the board is beveled and cross-grooved to simulate tile. It is painted white at the factory. Table I shows the acoustical absorption of the board.

Table I.—Absorption Coefficients^{1, 2}

128	256	512	1024	2048	4000	N.R. ³
0.67	0.67	0.82	0.89	0.91	0.98	0.80

¹ Data derived from tests conducted by the official Acoustical Materials Association Laboratory (Riverbank Laboratories).

² Mechanically mounted 10½ in. from boundary surface of sound chamber on 24-in. O.C. supports.

³ Noise reduction coefficient. The average of coefficients at frequencies of 256, 512, 1024 and 2048 cycles, given to the nearest 5 percent.

Exposures to 95% relative humidity, at 120° F. for 96 hr. have shown that the board gains less than 1% in weight by moisture absorption. There was no warping, buckling, or change in linear dimensions.

Cross-grooved glass fiber board is laid between troffer rows to form suspended ceiling

PHOTO COURTESY OWENS-CORNING FIBERGLAS CORP.



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Colored vinyl inks are used to print identifying markings on these vinyl-covered wires

Coded wire

CODING vinyl-covered wires for easy identification can be done in various ways, but until recently none of the methods in use were satisfactory for all applications. A new answer to the problem is Spiralon wire, extruded by Surprenant Electrical Insulation Co., Boston, Mass.

Old methods have limitations

The simplest method of coding is to vary the color of the vinyl covering. But there are only a limited number of solid colors which are readily distinguishable from each other. Thus this method of coding is limited to relatively simple circuits.

A greater range of colors can be obtained by covering the vinyl with colored fabric (usually cotton) and weaving in threads of contrasting colors. This method has proved unsatisfactory in many applications because the fabric is easily affected by dirt, grease, fungus, or rot. Such influences posed particular problems to the armed forces in the tropics.

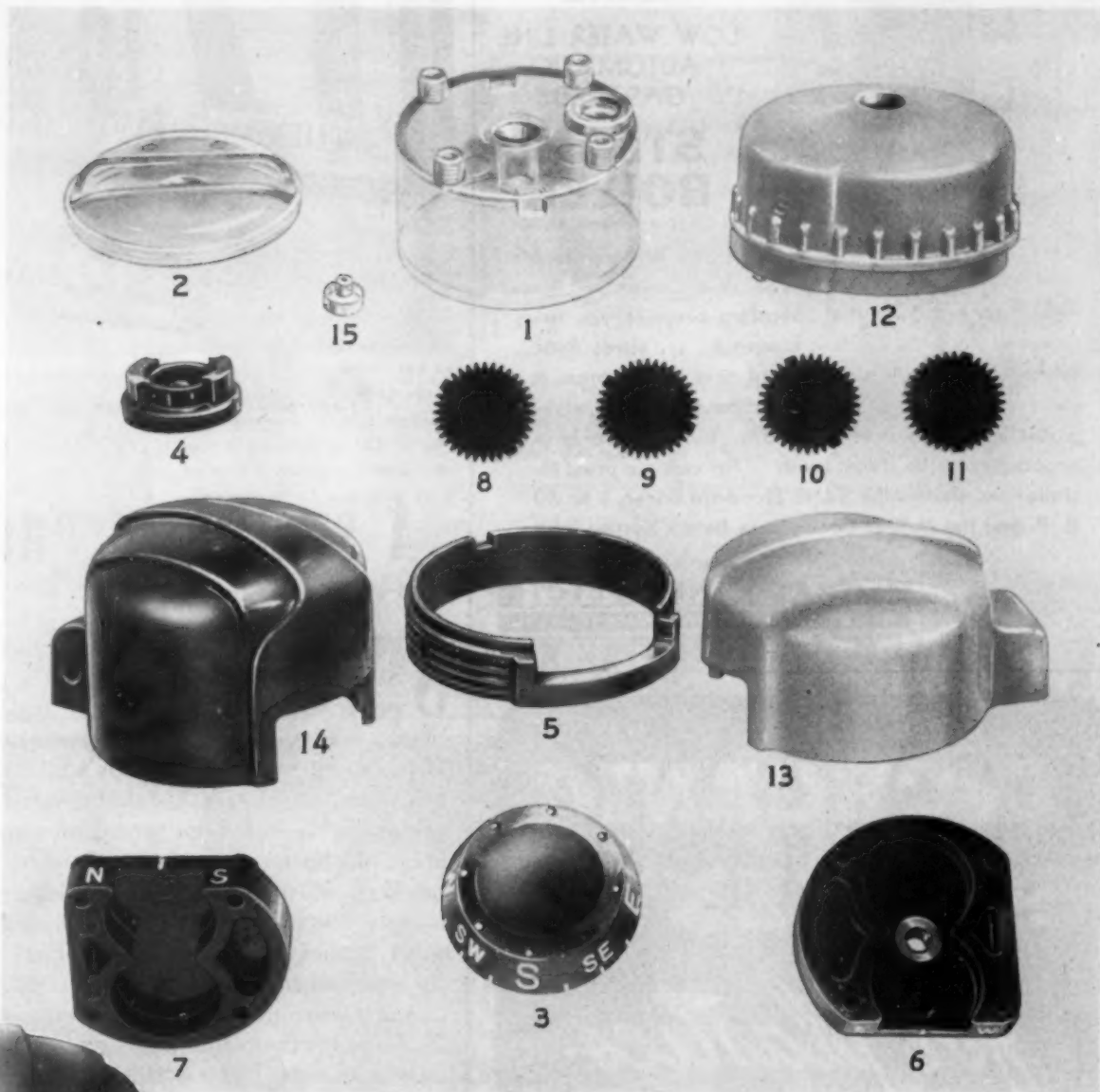
Over 1100 combinations

Spiralon wire has the color range of fabric-covered wire and the wearing qualities of vinyl. It is a vinyl-covered wire which has one, two, or three contrasting colors printed on it in spirals. By varying the color of the covering, the number of colors used, and the choice of colors, it is possible to produce over 1100 different coded wires.

Surprenant has developed a machine to print the spiral markings in vinyl ink. The machine can be used to print on any wire with an outside diameter of 0.025 in. or larger and the coded wire costs no more than ordinary vinyl-covered wire. For some specialized applications Spiralon is also available with a nylon coating over the markings.

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Case was originally for gas pump price sign

A switch in end use

SOMETIME AGO Ten Hoeve Brothers, 658 Market St., Paterson, N. J., developed a gasoline pump price sign case (above). It had a transparent Styron holder into which the various price tags fitted. It was fastened to the pump by a metal bracket.

Through the ingenuity of the manufacturer, the pump price sign has now been turned into a desk piece (below)—the holder displaying a calendar. A plastic base has been added to the original holding fixture. What is more, the pump sign has a promising future in such other applications as exit sign holders and containers for luminous address numerals.

A. J. Desimone Corp., 180-190 Putnam St., Paterson, N. J., molds the holder in a stainless steel 1-cavity die having an air cylinder attachment to operate the core.

Polystyrene case has new use as desk calendar



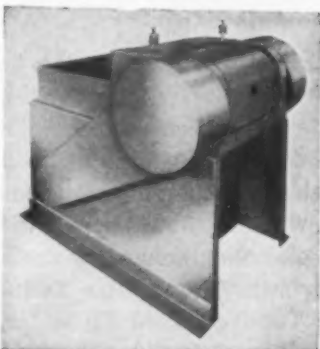
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New!



CUMBERLAND ROTARY CHOPPING MACHINE

This cuts slab material from compounding mills, chops continuously extruded rods, sheets or strands, and cuts up calender roll side shear strips. This machine is also used in conjunction with extrusion machines to produce cube or pellet material suitable for a molding compound.

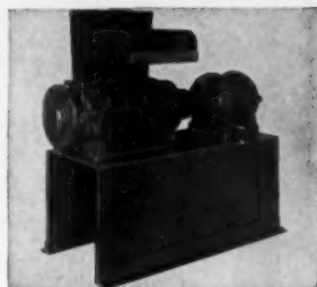
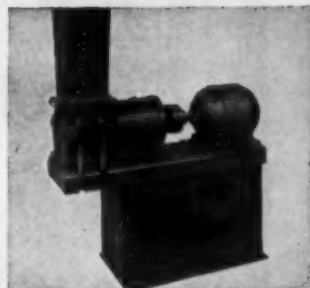


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This is useful primarily to manufacturers who compound plastic materials. The machine may be used to reduce material for use as a commercial product without further granulating. Or it may be used to prepare material for subsequent final reduction in a granulating machine.

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Looking toward 1948

(Continued from page 60) volume of business. True, literally hundreds of machines were idle during late Spring and Summer, but their owners used the lull to repair and improve their equipment and develop ideas for new products.

The thermosetting branch of the industry was only slightly affected by the slump. Their production for the year has broken all records, and the molding powder suppliers have had difficulty in meeting demand all year. Paradoxically enough, the thermosetting molders are hungry for business, but that is a story of improved equipment which will be discussed under "Phenolics." This evolution into improved and more rapid thermoset molding of more and bigger pieces has gone on so quietly that many of the operators have scarcely noted its significance.

Consumption goes up

Since August, consumption of plastics materials has gone steadily upward to the date of this writing. Cellulosics and polystyrene have been increasing by several million lb. a month. The vinyls go up in 2,000,000 lb. leaps, and the thermosetting materials have maintained their former levels; in fact, August, with almost 18,000,000 lb. of phenolic molding material, was an all-time record month. Again this feature follows a national trend. *The New York Times* business index graph, reproduced on page 60, shows that plastics follows general business rather closely despite its comparatively late entrance into the industrial field.

Even though plastics is a unique and independent industry, it is perhaps even more tied to all industry than any other single branch except steel because it is essentially a parts industry, and those parts are used for almost everything under the sun. Therefore, any amateur economist would know that plastics is almost certain to follow the general line of industrial activity; and this rule seems to hold true regardless of shortages in chemical raw materials that have supposedly held up plastics progress at various times.

The plastics industry has not yet created a big enough dent in any one application so that it can run ahead while other industries remain behind. A hypothetical example of a development which might make this possible would be a plastic that would replace brick. In the first stages of replacement, this plastic brick might run well ahead of other industry in its production index, but eventually it would have to level off to a consumption rate that could be absorbed by the industries needing brick. All of this points to the fact that the plastics industry in its present stage is not likely to have a serious slump unless all industry slumps, nor is it going to have a separate boom unless its products can be absorbed by other industries. Individual plastics may go up or down within the industry, but the industry as a whole, we believe, is tied to the entire industrial economy. For example, 25%

of pre-war production of plastics was said to be applied in the electrical industry: if that industry slips or moves ahead, the change is certain to show up in plastics production. A great portion of that part of plastics going into the electrical industry is thermosetting.

A large part of the output of the thermoplastics industry today is going directly into the retail trade, either as complete items or parts of items for over-the-counter sale. For the part of the industry interested in this phase of selling, it is noted that total retail over-the-counter sales for 1947 were expected to reach a record high of \$108,000,000,000, in comparison with approximately \$96,000,000,000 in 1946.

This over-all economic situation is one reason for the big upsurge in plastics products business during the last quarter of 1947. However, it must be remembered that it represents a possible 15 to 20% rise in retail prices and a drop in unit sales from 1946 of from 5 to 10 percent.

A further measure of business progress was a tentative Government figure released on November 20 which indicated that the over-all industrial 1947 production rate in the United States would reach \$235,000,000,000, in terms of dollar totals by New Year's Day 1948—a record never closely approached before and a 15% gain over 1946. But even that rate, stated in dollar terms, fell slightly short of achieving President Truman's goal of boosting physical production—things rather than dollar volume—by 5% in 1947 over 1946.

The general price rise for retail goods in 1947 of from 15 to 20% was not evident in plastics raw materials although there is no way of knowing exactly how all consumer items fared. Several materials—acrylics, polyethylene, and cellulose acetate among them—were reduced in price. Vinyls were both increased and decreased, depending upon the formulation. Phenolics were slightly increased in some cases. Chemicals used in plastics manufacture were nearly all raised slightly, and unless there is a general economic upset, some of these raises are certain to be reflected more forcibly in resin, plasticizer, and some molding material prices in 1948.

How the over-all production situation will carry over into 1948 is anyone's guess. Any good economist can give half a dozen reasons why there will be either less or more money spent in 1948, but it is significant for plastics that one of the reasons given for less retail store buying in 1948 will be more expenditures for homes and automobiles. In both of these fields, plastics is assured a good market.

Many experts believe that the upward surge of plastics in the Fall was due largely to Christmas buying, but our investigation could not confirm that theory. Tool makers seemed to be busy with new dies for 1948 delivery, and the acetate and polystyrene upsurge was by no means confined to toys or other Christmas goods.

Too many variables

We have no intention in this magazine of attempting to predict the exact amount of plastics that will be



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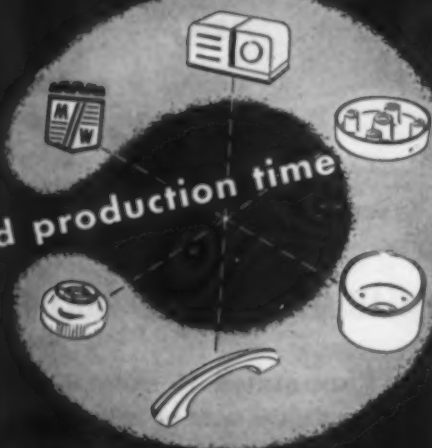
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consumed next year. There are simply too many variables to work around, and besides, we are reminded of a quotation from the National Shoe Manufacturers' Assn. which took issue with glowing forecasts of continued high prices by culling from minutes of the association's meetings between 1917 and 1921 enough facts to show that "efforts to look ahead were almost uniformly unsuccessful."

Furthermore, we are cautioned by a recent business leaders' poll taken by the Scripps-Howard newspapers wherein 60% reported that they expected rough going in 1948, and the balance apparently believe that serious trouble is farther away, or refused to guess. Certainly there is no unanimity in that kind of thinking. Then, too, of 100 economists polled by F. W. Dodge Corp., the majority foresee an upward trend in industrial production in the first quarter and a decline in the last three quarters of 1948 as compared with 1947.

Regardless of what happens to the general economy, we are giving here some of the potentialities in a few of the industries that use plastics, adding our opinion that the supply situation for plastics materials and processing looks far better than at any time since before the war in all important categories except plasticizers and urea, which latter should be cleared up by late Summer if the Du Pont prediction on page 73 of more urea crystal by Fall is realized.

The market for plastics in the various fields enumerated below is only a portion of the industry's potentiality, but it is interesting to speculate on these fields alone if plastics should reach their full possibilities in each of them. It should be remembered that the capacity for producing plastics materials will be far greater in 1948 than in any other year due to the near completion of nearly all the raw materials producers' expansion programs and the tremendously expanded facilities of the processors to manufacture finished or semi-finished goods. A continuing shortage of practically all metals, as well as of wood and other materials, will also give plastics innumerable opportunities to prove their worth in applications where they have not been popular or even been tried before. With such possibilities open, plastics should be in even greater demand in 1948 than ever before; once again plastics have a chance to prove their intrinsic worth—not as substitutes or mere replacements, but as basic materials selected and engineered to take advantage of their desirable and useful characteristics. Some of the markets in which plastics will make unusual progress in 1948 are the following:

Construction: Something like 850,000 permanent private housing units were due to be started in 1947. There will be at least that many and probably more in 1948. In addition, there should be an increase in construction of industrial plants, warehouses, office and loft buildings, stores, restaurants, garages, and other nonresidential types. Construction volume was running at over \$1,000,000,000 a month during many months of 1947.

The size of this market for plastics is almost unbelievable. They are used in electrical and lighting fixtures, upholstery for furniture and fittings, wall coverings, window curtains and shower curtains, sink and table tops, plastic screen cloth, some types of hardware, wall tile, extruded trim, and some types of structural panels, besides countless smaller applications. Then there is a reported \$4500 prefabricated house with walls and ceilings made of a sandwich consisting of a plastic core laminated to aluminum. And for each of the houses and many of the industrial plants, there will be refrigeration units, gas and electric stoves, and electrical appliances requiring plastics parts.

Close kin to the housing field is the trailer coach market, an interesting field for plastics trim, interior lining, appliances, upholstery, etc. Dealer-placed orders rolled up during the second half of 1947 amounted to 75,000 trailer-coaches at \$2500 each.

Automotive: The automobile industry turned out approximately 4,800,000 cars and trucks in 1947. The long range view is good. Despite big post-war production, only 1,000,000 passenger cars have been added to the total on the road in six years. Most of the 37,000,000 vehicles now in use and averaging $8\frac{1}{2}$ years old, must be replaced soon. The 1948 production, it is hoped, will be about 3,900,000 cars and 1,400,000 trucks.

There has been some talk that plastics had passed its peak in automobile construction and trim; but that seems a short-sighted viewpoint based on a few manufacturers' whims to lop off a few molded thermoplastic items from their 1948 models. Competent observers believe that plastics will return for those applications in the near future, not only for functional reasons but because metal will become even more difficult to obtain. Aside from thermoplastics, the automotive industry consumes several pounds of phenolic molded pieces per unit; vinyl coated fabric as well as Saran woven materials show signs of constantly increasing usage in interior linings and upholstery; laminated panels are becoming more acceptable for taxis, station wagons, and truck cabs as lining materials.

The day may come when structural parts of vehicles will employ plastic materials, but hardly in 1948. Passenger cars used as much as 7 lb. of plastics per car in 1941. There are no statistics to show how much is being used today, but we'll venture the opinion that in 1948 the average will be no less than 10 lb. per unit, counting all passenger cars, station wagons, trucks and cabs. When the plastics used in upholstery, laminates for interior lining, safety glass, brake linings, adhesives, electrical parts, ornaments, and stop lights are added together, the poundage is not small.

Some cars, trucks, and cabs may use little plastics, but others, such as re-upholstered cabs using vinyl upholstery, run up the average. The vinyl folks alone are shooting for an eventual average of 15 lb. per unit, which includes not only upholstery, but such items as pedal pads, electrical insulation, and extruded strips for sealing around doors and fender edging. Saran,



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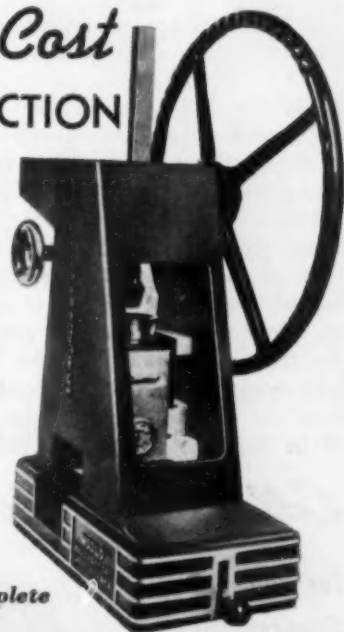
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• The new NATCO A-33 Light Sensitive Machines offer maximum production on plastics where super sensitive operations and high speed are of paramount importance. These NATCO machines offer flexible spindle arrangements for up to ten spindles. Spindle speeds from 650 to 3550 RPM are provided by quick-change sheave arrangement. Close control and high speed are features of all three models of the NATCO A-33 Machines providing the following feed arrangements: (Model A-33A) Hand and Foot Feed; (Model A-33A) Combination Hand and Foot and Air Oil Feed; (Model A-33B) Air Feed. Write Dept. MP for NATCO Bulletin 247.

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Supersensitive
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too, is making a big dent in the seat cover business. Put all these things together, and the poundage is large. At a low average of 10 lb. per unit, that would mean 50,000,000 lb. of plastics for automotive use in 1948.

Refrigerators: Over 4,000,000 refrigerators have been made since the end of the war; an additional 4,000,000 are expected by the end of 1948. The industry expects to sell 18,000,000 in the five-year period between September 1945 and January 1, 1951. The amount of plastics used per unit is increasing. Some use little, others a lot. Six pounds per unit is a low average. If 4,000,000 units are made in 1948, the total would be at least 24,000,000 lb. of laminate, acetate and butyrate, ethyl cellulose, and polystyrene, to say nothing of the phenolic or vinyl in electrical parts and for insulation.

Radio sets: The concept of radio set "saturation" has been changed. The pre-war idea of one set per family has been changed to an average of four per family. By that concept, the market is only 37.5% saturated. The potential is 100,000,000 sets. In 1947 production of radio and television sets ran close to 17,000,000 units to establish a new record. FM and television may even cause junking of old sets and increase demand for new ones. Far more than half are small sets, many with plastic cases and others using a plastic covering over wood, or resin adhesives in veneer. Tube bases and electrical parts require plastics materials. Many grilles are constructed of plastic. Plastics cases range from 1 to 4 lb. in weight. It seems safe to estimate a low average of 2 lb. per set, counting all plastic used by the industry, but it is dangerous to estimate how many sets will be made in 1948.

The pattern continues

These are only a few of the major markets for plastics. But almost the same pattern is present in electrical equipment, appliances, insulation, and fixtures; in textile, chemical, and paper-making machinery; in advertising signs; in gas and electric stoves; in buttons; and in many other products. In this connection it is interesting to note that one plastics company sales manager says that 40% of production—mainly phenolics, melamines, and vinyls—goes into volume industrial uses purely for utility and that less than 30% is used in decorative or so-called gadget type applications.

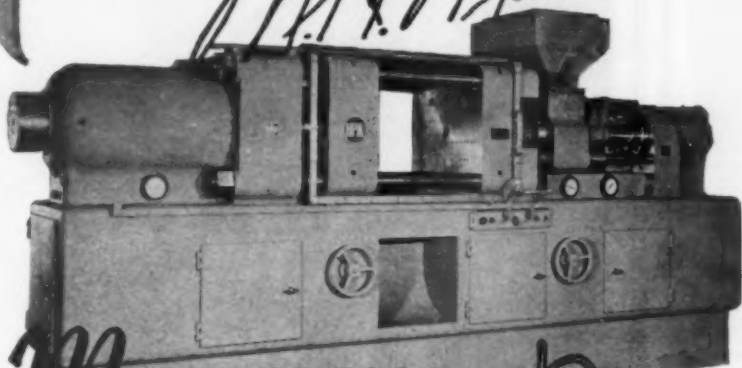
If industry continues to produce at accelerated rates, and the public continues to buy, the demand for plastics should go up at a greater rate than that of almost any other material now that they have proved their functional utility. The fear that the general public will turn thumbs down on plastics when other materials are again available was dissipated in the last half of 1947. If the public has money to spend in 1948, plastics will get a greater share than they ever have in the past. And the industry will get that share because it will dig up those applications where plastics belong.

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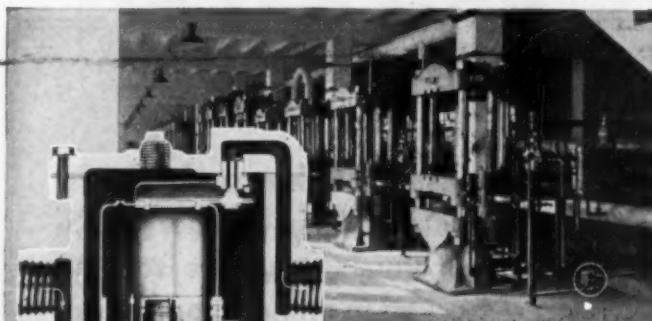
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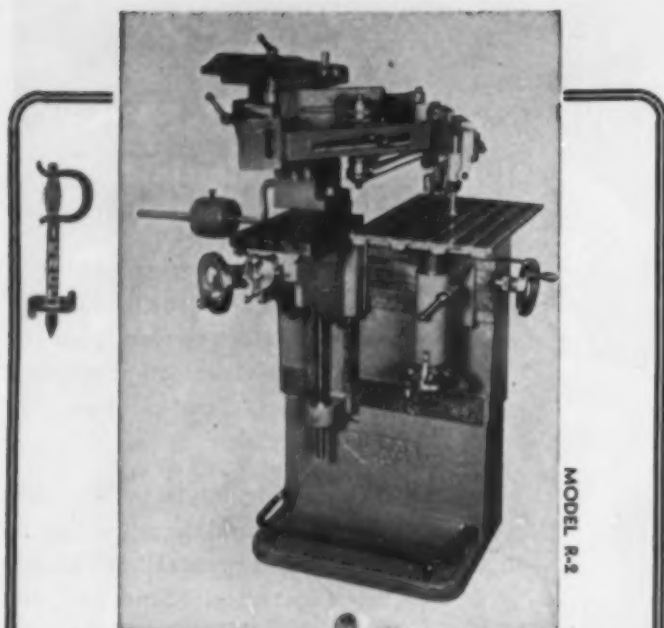
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Red, blue, and white polystyrene make a gay miniature garden set. Umbrella is detachable

POLYSTYRENE

TELEVISION sets, fireplaces, clothes hampers with opening tops, highboys with removable drawers, and living room sofas with a flock finish add realism to toy furniture and keep the pigtail set right in step with real furniture trends.

These new designs are among the recent additions to the standard toy furniture lines put out by the Plastic Art Toy Corp. of America, East Rutherford, N. J. Made to scale, the movable parts and modern appearance were made possible through the use of plastics. The entire line, consisting of living room, dining room, bedroom, bathroom, kitchen, and terrace sets, is molded of Styron polystyrene by the Columbia Protek-site Co., Inc., Carlstadt, N. J.

Durable, colorful pieces

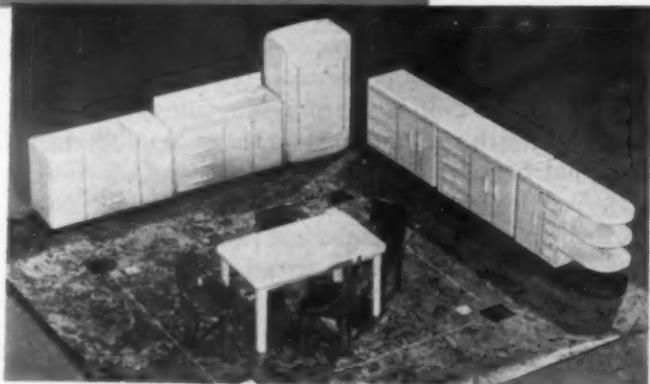
This material gives sturdy pieces with smooth, lustrous surfaces which are easy to keep clean. All the furniture is designed so that it is inclosed on all sides and so that there are no protruding sharp edges. A wide variety of colors to fit in with present day color schemes is another advantage of the polystyrene. For instance, the bathroom sets are molded in delicate pastel shades; beds have white spreads; the simulated mahogany living room chairs and sofas may be flocked to produce a velour finish in pastel shades. Mirrors in the dressing tables and dressers are made of a high gloss, silver finish paper.

Each set of furniture is sold in a folding type box with a die-cut platform which holds the pieces securely during shipping. The interiors of the top and bottom of the box are printed to form two walls in appropriate designs. Each box of furniture is complete with a reversible printed "broadloom" floor sheet which comes in harmonizing colors.

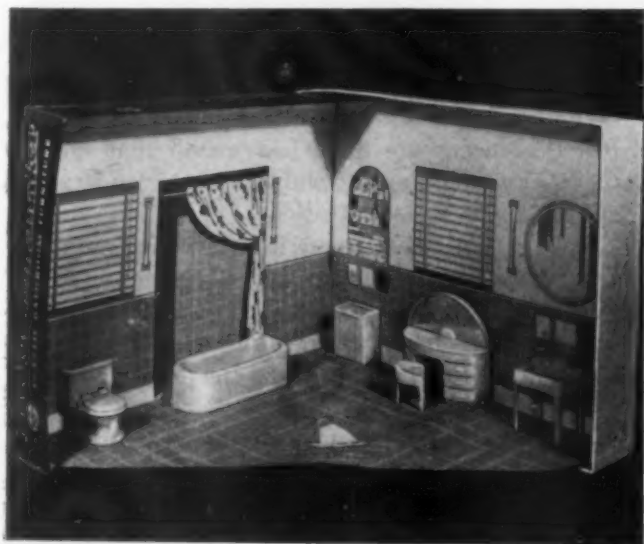


Flocked chairs and sofa, television set, and fireplace book shelves highlight living room

IN TOYS



"Linoleum" floor sheet which accompanies set adds realism to this blue and white kitchen



Box interiors are printed to form walls for the various rooms. These bathroom toys come in pastels; the clothes hamper has an opening top and toilet has hinged cover, seat

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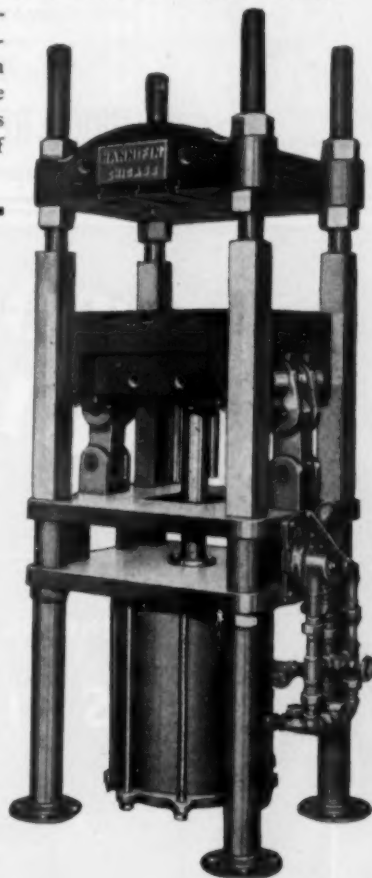
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Raw materials

(Continued from page 72) and after consultation with producers, we have estimated the 1947 consumption of vinyl for film, sheeting, and coated fabric as in Table III, page 71.

The figures given are, of course, rough estimates, but they indicate a trend. The low percentages are probably less accurate than the high ones; there is some question as to whether there is that much resin going into bookbinding, luggage, and radio coverings. There is also likely to be considerable overlapping in the household and wearing apparel groups.

Another interesting division is that between film and sheeting. It is estimated that during most of 1947 there were about 2,000,000 lb. of resin used in film for every 1,000,000 lb. of sheeting, but recently the ratio has shown signs of changing to a greater proportion of sheeting.

Another possible switch that may soon be more noticeable is the ratio between resin used in textile and paper coating, now estimated at over 80% for textile coating. More and more paper is being coated with vinyl, especially since paper makers have discovered that when paper pulp is mixed with nitrile rubber and then coated with vinyl, it makes a tough, durable shelf paper that housewives are using in place of oil cloth. The use of vinyl with paper is only in its infancy. Not only shelf paper but wall paper and packaging paper are going to have a lot of vinyl spread over them in the years to come.

Extruded vinyls, in addition to that used for wire coating, show no signs of falling off the general advance. Belting, edging, and tubing continue to make progress. Among the most promising of the extrusions is garden hose, with 1947 production reportedly five times over 1946 and threatening to take over the whole field. Mr. John Public seems to have acquired a genuine fancy for it—he likes its light weight and cleanness. There is some question over the figure of 74,000,000 lb. of vinyl used for molding and extrusion in Table II (p. 70). Producers say there just wasn't that much made. But regardless of the total figure between 80 and 85% is thought to be for extrusions.

Molded vinyls of the elastomeric type are in quantity production but by no means at their prospective peak. Rigid vinyl molding and extrusion compounds are still not actively promoted by producers as they are anxious to select uses for which properties of the material make them more suitable. Promotion of molded vinyl is certain to come later when more resin is available and the price of resin gets down somewhere in the 20¢ a lb. bracket. No one will guess when that day is due to arrive, but it will be mighty strange if it doesn't. Pure resin may now be obtained at as low as 33¢, and no plasticizer is necessary when the material is used for rigid molding.

It is simply impossible to list here all the new and ex-

perimental applications that are going on in the vinyl field. In the first place, we doubt that there is anyone in the United States who could name them all. The spread is too great and the research is secret in many

Table IV.—Plasticizers Production in 1945 and 1946*

	1946 1000 lb.	1945 1000 lb.
Plasticizers, cyclic		
Total	83,839	138,955
Phosphoric acid esters:		
Tricresyl phosphate	10,348	13,552
Phthalic anhydride esters, total	57,925	98,945
Dibutyl phthalate	12,643	45,915
Dicapryl phthalate	1,047	.....
Dicyclohexyl phthalate	4,536	.....
Diethyl phthalate	10,710	9,700
Dimethyl phthalate ^a	5,469	18,822
All other ^b	23,520	24,508
All other cyclic plasticizers ^c	15,566	26,458
Plasticizers, acyclic		
Total	30,757	30,314
Azelaic acid esters ^d	34	37
Lauric acid esters	367	364
Citric acid esters: Triethyl citrate	.....	539
Oleic acid esters ^e	4,379	3,148
Phosphoric acid esters ^f	1,381	2,160
Ricinoleic acid esters	36	.....
Sebacic acid esters: Dibutyl sebacate	2,335	5,853
Stearic acid esters, total	5,881	3,074
Butyl stearate	1,469	832
Diethylene glycol monostearate	204	.....
Glyceryl monostearate	2,088	1,061
All other ^g	2,120	<1,181
All other acyclic plasticizers ^h	16,344	15,139
GRAND TOTAL	114,596	169,269

* Source: U. S. Tariff Commission.

^a Includes diethyl phthalate for use as an insect repellent.

^b Includes phthalic anhydride esters of phenols, substituted cyclohexanols, fatty alcohols, monohydric alcohols, cellosolves, carbitols and other dihydric alcohols, and phthalyl glycolates.

^c Includes aminonaphthalenes, toluenesulfonamides, synthetic camphor, menthylphenol, polymerized styrene, coumarone-indene, and abietic acid and benzoylbenzoic acid ester and fatty acid esters of cyclic alcohols.

^d Includes azelaic acid esters of monohydric alcohols and cellosolves.

^e Includes glyceryl mono-oleate, glyceryl trioleate, and oleic acid esters of monohydric alcohols, glycols, and cellosolves.

^f Includes phosphoric acid esters of monohydric alcohols and cellosolves.

^g Includes stearic, monohydroxystearic and chlorinated stearic acid esters of monohydric alcohols, glycerol, glycols, and cellosolves.

^h Includes esters of acids such as adipic, citric, lauric, pelargonic, propionic, ricinoleic, sebacic, tartaric, acetylated acids and others reacted with monohydric alcohols, glycols, glycerol, cellosolves, and other polyhydric alcohols. Plasticizers which are not esters include polyglycols and nitrogen containing compounds.

The above table shows a total of 114,596,000 lb. of plasticizer produced in 1946 in comparison with 169,269,000 in 1945. The figures for 1947 are not available, but are thought to be slightly above 1946. Plasticizers in most demand for vinyls are: tricresyl phosphate, dioctyl phthalate (which is included under "all other phthalic anhydride esters"), azelaic acid esters, lauric acid esters, oleic acid esters, phosphoric acid esters, ricinoleic acid esters, and sebacic acid esters. The total of these for 1946 was 47,000,000; for 1945 it was 52,000,000. Furthermore, a good portion of these named plasticizers are used for wetting agents, one of the oleics is used in bread to help keep it moist, and for other purposes. There are no prospects for more until raw materials such as naphthalene and castor oil are more plentiful, although several companies are working on new developments which might give added production in 1948

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cases. We do think it is important to point out the increased activity in the plastisol, organosol, and paste formulations. Eighteen percent of the processors who cooperated in a survey conducted by this magazine reported that they are using one of these materials.

These vinyl compounds can be used with or without diluents (solvents) and in some cases can be cast, spread, calendered, extruded, or molded. When used without a diluent, the paste or plastisol eliminates the costly and sometimes hazardous solvent recovering process. It is possible that these compounds may some day make calenders less important in vinyl processing, but there are those who insist that the calender will always be necessary for certain types of jobs, and it is in no danger of obsolescence. In England the paste resins have been widely used ever since the beginning of vinyl development. In this connection, it is interesting to note that returns from the MODERN PLASTICS survey on film, sheet, and coated fabric processors indicate that 50% of them use both calender and liquid coating processes, 27% use liquid coating only, and 23% confine their operations to calendering.

Biggest problem confronting the entire vinyl industry is the plasticizer shortage. Table IV, page 157, shows why. Production in 1947 was thought to be above 1946 but the relative position was worse because more plasticizer was needed. If 200,000,000 lb. of vinyl resins are produced in 1948, they will require about 70,000,000 lb. of plasticizers, which at the moment is not foreseeable. There will be lots of plasticizer around, but only a few types are the kind most wanted for vinyls. This plasticizer problem has harried the vinyl industry for the last three years. When the proper plasticizers cannot be easily obtained, some processors use any type available and, as a result, poor quality merchandise is put on the market. About 40% of the sheet and film processors declare that their volume was affected by a lack of plasticizer in 1947.

There are two plasticizer developments that may be helpful. First was the development of the so-called solid plasticizer which can be blended with vinyl and will not migrate. One company says it "forms an alloy with vinyl." This is the nitrile rubber type, such as Hycar used in Polyblend, a recently developed Goodrich compound which is advertised as requiring no plasticizer. Standard Oil of New Jersey is pushing Perbunan, also a nitrile rubber, for combining with vinyl to form a compound which requires little or no further plasticization and helps maintain flexibility at low temperature, as well as prevent migration at high temperature. However, developers admit that there are still some bugs to get out of these developments. The nitrile rubbers are difficult to work, and there are color problems involved. So far, however, development and use in actual operation look promising. One of the electrical companies in particular seems convinced that the vinyl-nitrile rubber combination is ideal for many types of wire coating. Another company is using this combination to produce film for food packaging and thus avoid the use of liquid plasticizer.

The second group of plasticizers, developed from vegetable oils, are recognized as high grade but are high-cost and scarce. Known as sebacates or resinous plasticizers, they are noted for aiding low temperature flexibility as well as preventing migration at high temperature. Developers are currently struggling to get them on the market at lower cost and in sizable quantity. There will be some interesting developments along this line in 1948.

Polyethylene

ONE of the most hush-hush plastic developments in this country during the war was polyethylene, a material first produced in England. Experts say that without polyethylene and its high-grade dielectric qualities, radar might never have been developed. Its electrical resistance is almost unbelievable. If placed between electrodes connected to a high-frequency voltage, a sheet of polyethylene will show no effect whatsoever, but if that same sheet is exposed to the flame of a match, it will melt like wax.

When applied as a coating for wire in places where it is subject to considerable abrasion, polyethylene is generally jacketed with nylon or vinyl. There is a slight tendency for the plasticizer from the vinyl to migrate into the polyethylene and reduce the power factor slightly, but that problem is burdensome only in high-frequency transmission, in which case the vinyl resin can be compounded with non-migratory plasticizers. In ordinary cable, the plasticizer migration is not serious enough to change the power factor of the coated conductor appreciably.

Because of its electrical qualities, it is assumed that the material's greatest outlet may always be in that field, but it is making great progress in the film field for packaging and in molding. The Tupper kitchenware bowls, bowl covers, tumblers, etc., are examples of its great potentialities in the latter field.

Bakelite and Du Pont are the only producers of polyethylene in this country. It is estimated that production in 1947 was somewhere around 11,000,000 lb., but both companies are increasing their facilities, and it is believed that production capacity at the end of 1948 will be at least 50,000,000 pounds.

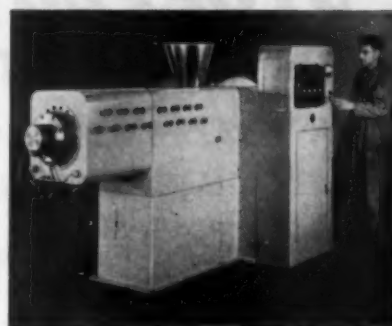
It is believed that the greatest future for polyethylene lies in packaging. It may be extruded into film from 1 to 20 mils in thickness; $\frac{1}{2}$ mil can be had, but at a premium cost. Polyethylene film is particularly applicable to packaging because it is chemically resistant; it contains no plasticizer to present subsequent odor and migration problems; and it is practically water-vapor transmission proof. It is also the lightest plastic in general use, with a specific gravity of 0.92, and will float on water without absorbing moisture, yet polyethylene film will permit gas to escape from a package composed of it. Thus, polyethylene is satisfactory for wrapping flowers and vegetables, for example, because

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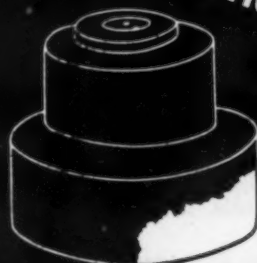


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PLASTICS DIVISION

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it permits oxygen to penetrate through the film and allows carbon dioxide to escape.

Polyethylene can also be molded into containers, and it has great possibilities in bottle caps or closures which are used without liners. Among other packaging applications is its use in sanitary milk bottles for infants and as foodbags for domestic refrigerators.

Polyethylene has been tried as a mattress cover, but its permanent elongation has handicapped it in this field. However, this permanent elongation, or cold stretch that won't come back, makes it acceptable for extrusion as a monofilament. The monofilament has been woven and exhibited as upholstery on furniture, but full development has been held back due to a shrinkage problem which is now said to have been remedied.

As a molding powder, polyethylene can be successfully used for products where flexibility and chemical resistance are desirable. Development has been delayed because of color problems and because there was not enough material available, but it is now reported that producers have developed a colored product with practically as much sheen and brightness as can be obtained with thermoplastics.

Acrylics

THE acrylic industry was hit hard when expected expansion of the private airplane field failed to materialize. Plans had been made to service this field on a big scale, and it was necessary to do some rapid re-vamping to counteract the situation which arose. But like all other branches of the plastics industry, acrylics came back strong. At the end of 1947 it was believed that the volume in sheet acrylic was anywhere from $\frac{2}{3}$ to $\frac{3}{4}$ of its war-time peak.

The acrylic molding powder situation was quite different. War-time capacity for molding powder was around 400,000 lb. monthly but the industry was not permitted enough material to operate at that volume. However, capacity was considerably increased after the war, and reliable sources have indicated that, in 1947, consumption of molding powder amounted to almost 1,000,000 lb. in some months.

The industry has been able to maintain and even increase its automotive business where its material is used primarily for medallions, horn buttons, radiator hood ornaments, stop lights, and decorative items. One of the companies brought out an improved formulation which it is said will withstand 15 to 20° more heat than the old formulations and is the same price.

The price of acrylic molding powder was reduced 15¢ a lb. during the year. In addition to the high heat-resistant material, the industry brought out corrugated and patterned or sanded acrylic which could be used for structural work inside buildings. There is also talk that a larger sheet than the presently standard size of 67 by 79 in. may be brought out in 1948. Supposedly the new $\frac{1}{4}$ to 1-in. thick sheet will be 100 by 120

inches. The annual rumor that a harder surfaced acrylic is in the offing is apparently no nearer realization than in the past—at least, not for the so-called standard acrylics.

When the industry lost much of its sheet business because there were fewer planes to build, management started to concentrate on various other outlets. Principal ones today are: display fixtures; store fixtures; light diffusers, such as false ceilings with lights above; refrigeration equipment, including windows, doors, etc.; glazing on Jeep curtains; sun visors for autos; signs and displays; house trailer windows; jewelry; fancy containers for packaging; and the ever-present brush backs and picture frames. One of the newest applications which may use up considerable poundage is a wind deflector for automobiles called a No-blo Deflector. It is the rear half of the front window and apparently does not scratch enough to harm the application.

During the year a fairly large market was developed in fabricating sheet for displaying the inner works of a given instrument or machine. Several washing machine companies ordered models in which a prospective customer could see exactly how the machine worked. In each case, the initial experiment was so successful that several hundred copies were made. Safety guards through which an operator of a machine may see what he is doing without getting an arm or hand in the way of dangerous equipment is another natural application for acrylic. Hobbyists, too, are using an ever-increasing quantity of acrylic sheet.

Producers insist that acrylic furniture is going over fairly well despite its high cost. They think that acrylic furniture, if of good design and made for a specific purpose such as for display use in a retail store, will always have a good market.

When asked about the acrylic kitchen equipment which is being exploited on a large scale in England, one producer said that the English work was done because of a shortage of porcelain enamel in that country, and he did not see wide adaptation of a similar application in this country. When asked about street lamps, the same producer replied: "Glass is awfully cheap, and we are not prepared to compete with it at the moment for that particular application."

A great deal of the acrylic sheet slump in 1947 resulted from the large number of business shutdowns in the fabricating field. Right after the war there were literally hundreds of these shops set up in various cities, most of which produced one article—a brush back, a picture frame, or a display fixture. They had no salesmen, and at that time they had so many orders that they thought their future was assured. Most of them employed only three or four men with a dozen or more girls for assembly and polishing. A typical plant would be equipped with two saws, two buffing wheels, an oven, cementing jigs, and no originality on the part of the owner. They were simply copyists of products already on the market. It generally followed that their designing was poor and fabrication of low quality.

When business fell off, they did not have sufficient

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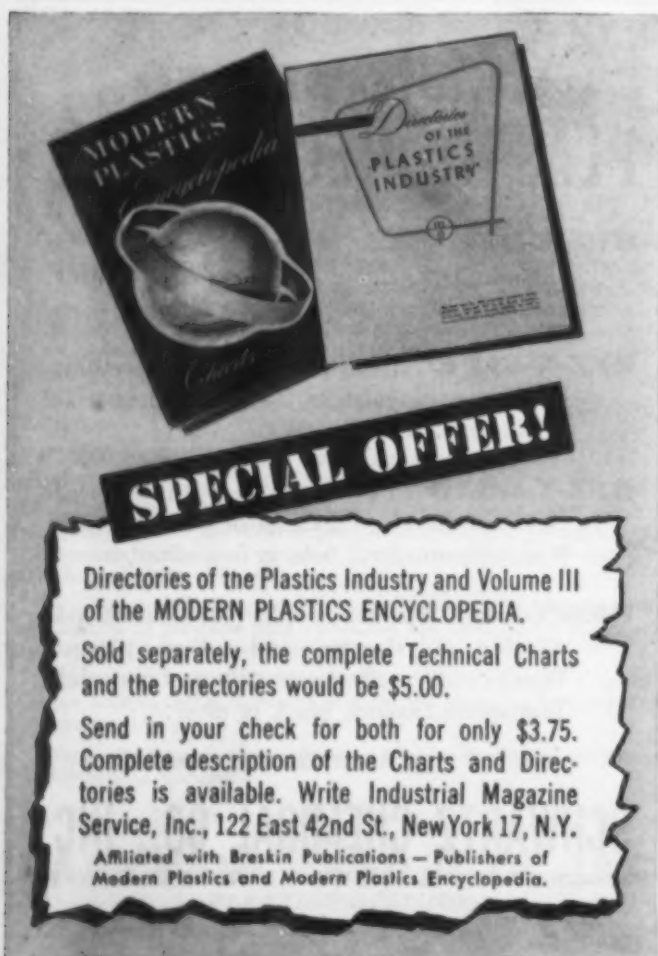
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capital to hold together until they could find new items to fabricate. Scarcely any of these organizations were ever listed in Dun & Bradstreet.

Most of these people are now out of business. They carried with them a few good operators who were caught in the stream but, by and large, this section of the industry has been cleaned up through the elimination of these inexperienced operators who had little knowledge of what they were getting into. In so far as the acrylic branch of the plastics industry is concerned, it is probably much better off now that the weeds have been pulled.

Polyvinylidene chloride

POLYVINYLIDENE CHLORIDE, made only by Dow Chemical Co., and sold under the trade name of Saran, is best known as the plastic used for screen cloth, but it has literally thousands of other uses. It can be used for extrusion and injection or compression molding, or as monofilaments, multifilaments, film, or latex. Famous for its chemical resistance, it is particularly valuable for use in chemical, paper, and textile plants where it may be used as tubing, vat liners, gears, valves, etc. During the past year, a liner was developed to use inside metal pipe, and a special valve was molded entirely of this material.

The use of polyvinylidene chloride in the molding industry has scarcely started. It is difficult to handle because of a tendency to break down at temperatures a little higher than its fabrication temperature and because special alloys must be used in handling it. Nevertheless, there is a belief that this use will eventually account for an increased portion of the production. Most of the production, which has been doubled six times since 1941, is used for extrusion of monofilaments which are woven into screen cloth and into woven fabric for upholstery and kindred applications. Some 7,000,000 lb. are said to have been used for screen cloth in the season that ended in June 1947; after a slump during the Summer months, it came back strong.

One of the screen cloth weavers reports that his company is operating on a three-shift, six-day week in two mills and is behind on orders. That the material is accepted by the trade is indicated by the type of advertising that has been used against it. The company just mentioned spent \$150,000 in an advertising campaign to acquaint the consumer with this material in late 1946 and in 1947 and is now in the midst of another campaign of equal scope.

The use of polyvinylidene chloride monofilaments for upholstery has been held up because most of the available material was used to meet the demands of the screen cloth market. So far, the work in upholstery has been largely concentrated on seat covers for automobiles. Complaints about the first seat covers indicated that the open mesh was abrasive and hard on clothes, but later development of a closely woven, well-

calendered fabric has largely eliminated that trouble. Other complaints on color and fading were prevalent two years ago but remedies have been found. Instead of only bright colors and plaid patterns, the material now may be obtained in pastel colors. Extruders and weavers say they can now match practically any color.

The use of Saran for upholstering davenport, chairs, etc., has been delayed until a more satisfactory and finer filament could be perfected. In the New York City show room of Chicopee Mfg. Corp. there is today a sofa upholstered with that company's woven fabric, made from the National Plastic Products Co.'s extruded 0.008-in. monofilament. The developers believe that it will take the market by storm when it is ready for sale. The fabric displays a blend of soft colors and has a certain resilience and comfort that simply invites "sittin'." Company officials refused to say when the fabric will be placed on the market, but it is believed that a shortage of material has delayed its introduction. One of the principal reasons for the success of this newer 0.008-in. dia. material is that size variations in the filament have been reduced to a minimum.

There are many other uses for this monofilament, such as for inner shoe soles, rope, handbags, and uppers for women's high-style dress shoes; but, because of lack of material, none of these markets has yet been developed to any extent. A big increase in supply of the polymer that came in toward the end of 1947 will relieve the shortage, and development programs can be more widely carried on.

During 1948 it is also probable that much more will be heard about even finer Saran filaments which can be spun into ultra-fine fibers and made into gossamer sheer fabrics. Such fabrics will probably be first channeled into the drapery and upholstery markets but will eventually find their way into clothing when blended with other fabrics. Developers claim that this is not a multifilament, but merely an extra-fine monofilament. The new fiber will be made by the Saran Yarns Co., a jointly owned subsidiary of the Dow Chemical Co., and the National Plastic Products Co., in a plant being built at Odenton, Md.

Promotion of Saran film and latex is now being pushed by the producers after they, too, were delayed due to lack of material. For the present, the film is expected to be confined largely to the packaging field for those items which can bear the higher cost. Its water-vapor resistance is said to be superior to other plastic films and it is recommended for packaging acids, essential oils, drugs, cosmetics, pharmaceuticals, and corrosive materials. So far, most emphasis has been placed on its use as a wrapper for cheddar cheese, a bottle cap liner, and a lamination with paper.

The most widespread use of the latex at present is for coating paper and paperboard. It is generally applied in coatings about $\frac{1}{2}$ mil thick, by spray, roller or spread coating methods. The latices are also recommended for adhesives, leather coating, corrosion-resistant paint, and for coating fabric where chemical resistance is important.

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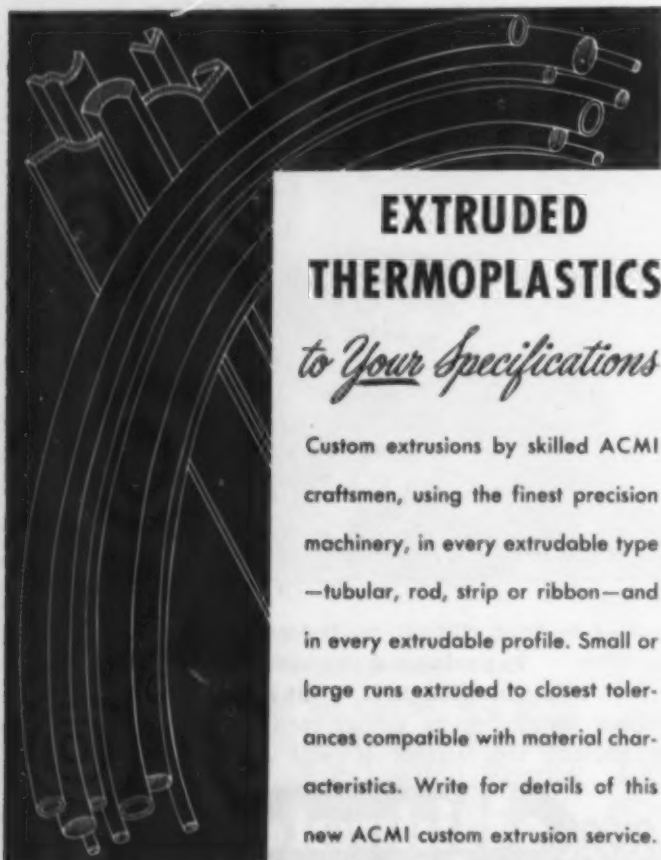
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Consumption of

OCTOBER broke more records in plastics consumption than anyone believed possible just a few months ago. Polystyrene went up to almost 11,000,000 lb., the highest month on record and producers insist that the gain is by no means confined to the Christmas toy market. One of the highest items was wall tile, somewhere between 5 and 10% of the total. Acetate moved up strongly to over 5,000,000 lb. of molding material and to an astounding 1,000,000

PLASTICS AND SYNTHETIC RESIN CONSUMPTION From Statistics Compiled by Bureau of

Materials

Cellulose acetate and mixed ester plastics^a

Sheets

Continuous (under 0.003 gage)

Continuous (0.003 gage and upward)

All other sheets, rods, and tubes

Molding and extrusion materials

Total

Nitrocellulose plastics^a

Sheets

Rods and tubes

Total

Other cellulose plastics

Phenolic and other tar acid resins

Laminating (dry basis)

Adhesives (dry basis)

Molding materials^a

All other, including casting (dry basis)^a

Total

Urea and melamine resins

Adhesives (dry basis)

Textile and paper treating (dry basis)

All other, including laminating (dry basis)^{a, d}

Total

Polystyrene^{c, e}

Vinyl resins

Sheeting and film, including safety glass sheeting^a

Textile and paper coating resins (resin content)

Molding and extrusion materials (resin content)

All other, including adhesives (resin content)^e

Total

Miscellaneous

Molding materials^{a, f}

All other (dry basis)^{a, g}

Total

Grand Total

^a Includes fillers, plasticizers, and extenders. ^b Data cannot be published without disclosing operations of individual establishments. ^c Excludes data from protective coating resins. ^d Excludes urea and melamine molding materials; see footnote 7. ^e Dry basis, including necessary coloring material

plastics materials

lb. of continuous sheeting in the "over 0.003 gage" grade, thus reflecting the Christmas market in transparent packaging.

Vinyls broke their previous high of 17,000,000 lb in January 1947 to register over 18,000,000 in October. The big gain was in extrusion and molding materials.

Phenolic molding materials again hit almost 18,000,000 lb., with molders still asking for more and claiming they have excess press capacity.

IN POUNDS FOR JAN. THROUGH OCT. 1947
Census, Industry Division, Chemical Unit

September 1947	October 1947	Total for first 10 months
lb.	lb.	lb.
457,878	489,980	6,271,741
608,700	1,009,531	6,473,486
217,844	299,331	3,371,684
4,142,506 ^a	5,104,501	50,038,817
5,426,928 ^a	6,903,343	66,155,728
669,081	767,965	7,979,915
251,431	271,966	3,231,923
920,512	1,039,931	11,211,838
^b	^b	1,685,554 ^c
3,351,733 ^a	3,477,013	33,791,406
1,766,449	1,964,403	17,256,872
17,408,459	17,886,441	161,740,346
4,735,441	4,801,174	53,207,797
27,262,082 ^a	28,129,031	265,996,821
3,995,240	4,596,590	40,339,989
1,272,595 ^a	1,425,209	13,691,951
455,436 ^a	698,165	6,506,019
5,723,271 ^a	6,719,964	60,537,959
8,381,059	10,930,918	72,936,728
5,790,041	5,964,197	51,089,015
1,193,678	1,780,841	13,373,207
5,787,689	7,671,098	59,525,070
2,353,845	2,623,490	22,609,034
15,125,253	18,039,626	146,596,326
4,397,938	4,821,098	47,019,493
3,634,228	4,244,976	26,074,297
8,032,166	9,065,074	73,092,790
70,871,271 ^a	80,827,887	698,213,744

^f Includes data for urea and melamine, acrylic acid, and miscellaneous molding materials. ^g Includes data for petroleum resins, acrylic acid ester resins, mixtures, and miscellaneous synthetic materials. ^a Revised. ^c The figure given here is for January through April only.

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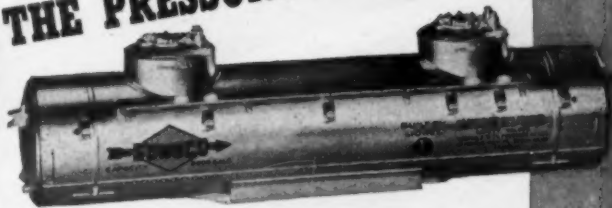
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Rebuilding the World Economy

by Norman S. Buchanan and Friedrich A. Lutz

Published by Twentieth Century Fund, Inc., 330 W. 42nd St., New York 18, N. Y.

Price \$3.50

434 pages

The critical position of the United States in the world economy today, as a market for other nations and as a source for investment capital, makes it important that the American economy itself be stable so as to assist international stability. As chief proponent of a free-enterprise economic system in a world where other peoples have identified that system with instability, booms, and recessions, it is important that the United States avoid wide cyclical swings in national income.

This cannot be done solely on a national basis. Economic isolation would force much of the rest of the world (being short of dollars) into a barter position in which the pursuit of common policies would be impossible.

This book, typical of the profound yet clear quality of Twentieth Century Fund publications, presents the facts basic to intelligent action on the problem of international economic reconstruction. It puts forth a program of specific steps looking toward the development of multilateral trade and constructive foreign investments.

Design for Business

by J. Gordon Lippincott

Published by Paul Theobald, Chicago, Ill.

Price \$8.00

224 pages

The guiding spirit of the twentieth century is change. As a result, the American consumer expects and demands new and better products each year. That, according to industrial designer J. Gordon Lippincott, is where the industrial designer fits in. It is

his business to apply art so that the manufactured article will have the right form. And the only criterion of right and wrong in business is sales.

This book explains the basic principles which the industrial designer follows to give products style, beauty, utility—all for one purpose: to increase sales. The author goes back to fundamentals, as in his chapters on "Man is the modulus" and "The elements, principles, and attributes of design." But the discussion never strays from sound business economics. Witness the definition of style: "Style is a mode of consumer acceptance and derives its power from our tendency to imitate."

The author has designed his book, as he would design a product, for sales. He is trying to sell industrial design to businessmen who should be the clients of industrial designers. With the help of a plethora of case histories and over 300 illustrations, he has done an excellent job of selling—and of showing the customer exactly what he is buying.

Small Wonder

by Gessner G. Hawley

Published by Alfred A. Knopf, 501 Madison Ave., New York, N. Y., 1947

Price \$3.50

220 pages (plus index)

In a broad discussion of colloid chemistry, presented in non-technical style, the author touches upon many branches of this science and points to the extensive avenues which it opens. The importance of colloid chemistry in industry and in scientific research is exemplified in discussions on subjects such as sewage disposal, purification of water, homogenization of milk; and on the structure and behavior of rubber latex, adhesives, emulsions, and blood. The book is not intended as a textbook, but rather as a simple short cut for the layman who wishes to understand scientific principles. It provides a practical foundation for further study. Technical theories are explained in terms of everyday analogies and are graphically illustrated by diagrams and

AFTER nearly six years of planning and four years of work by technicians in the plastics industry, the Society of the Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y., has published the *SPI Handbook*, containing a wealth of engineering information on plastics.

A project of the Engineering & Technical Committee, headed by N. J. Rakas, the handbook is designed to aid the beginner in the plastics business as well as to provide tips and source material to those in the industry for many years.

Special subcommittees, composed of over 300 engineers in all, were assigned to write the 10 chapters, totaling 430 pages. These chapters cover 1) classification of plastics molding materials,

2) molding and forming of plastic parts, 3) design of molded articles, 4) design standards for inserts—their application in plastic parts, 5) standards for tolerances on molded plastic parts, 6) cementing and assembly of plastics, 7) testing plastics parts, 8) mold design and recommended steels, 9) machining and finishing plastics parts, and 10) laminated products and their fabrication. They are supplemented by charts, pictures and drawings.

The S.P.I. plans to revise the present chapters from time to time and to add new chapters whenever necessary.

Each member of S.P.I. will get one free copy; extra copies will cost \$4.50 each. The book will also be sold to non-members for \$7.50 a copy.

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ABRASIVE PROBLEM: Getting Authentic Information



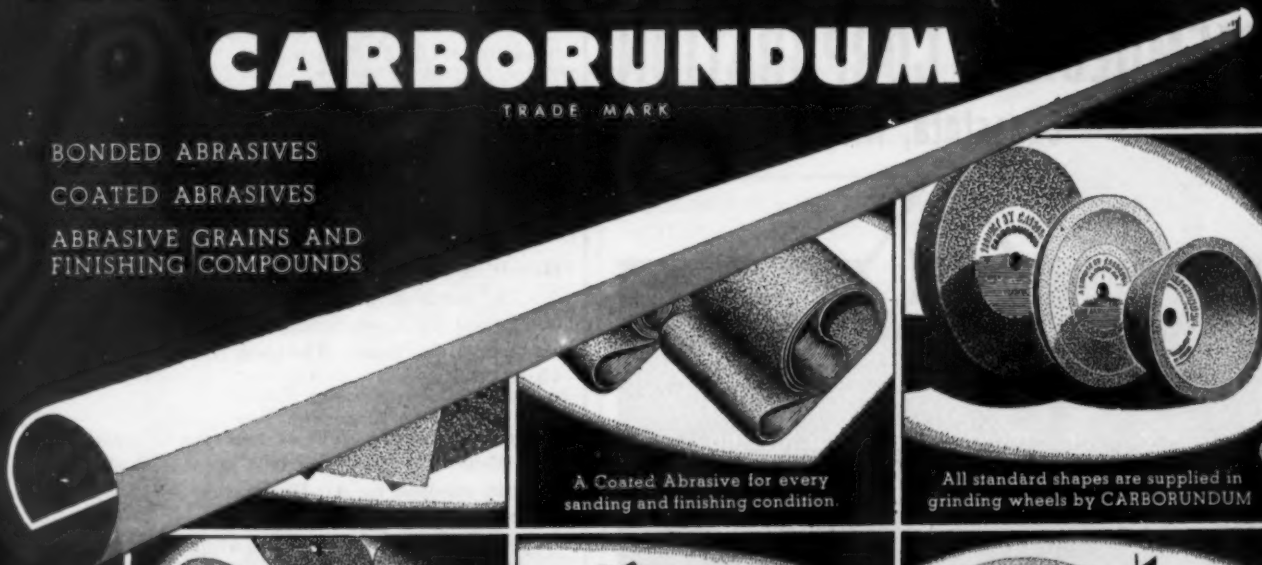
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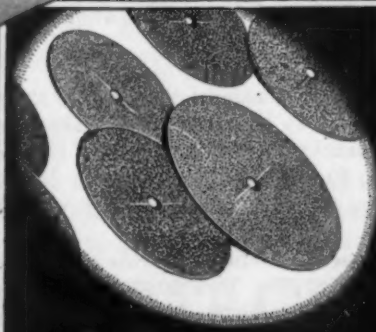


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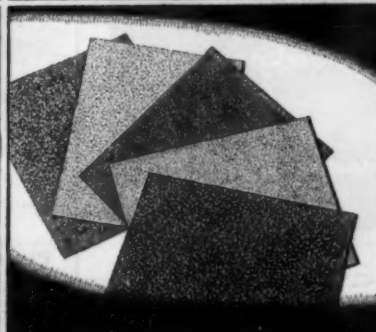
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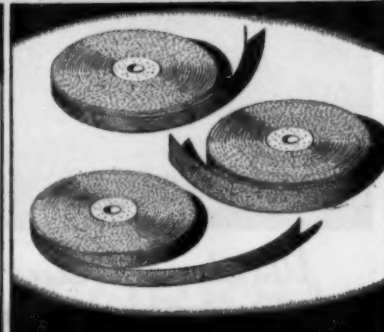
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photographs. Authoritative references are given throughout the book and a convenient index facilitates finding specific material.

Bidding and contract procedures—A new 32-page booklet, "How to sell to the government," has been issued by the N. Y. Journal of Commerce, 63 Park Row, New York City 15, to help more businessmen get their share of sales in the \$5,000,000,000 annual government market. It explains the nature of the various government markets and tells how to get on mailing lists for materials and products wanted. Special sections are devoted to the many agencies of the federal government, as well as to state and municipal governments. Copies cost 50 cents each.

Precision instruments—An 8-page bulletin, "A survey of precision instruments," has been published by the Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill., listing the company's standard products and services. Groupings are as follows: linear, coordinate, angular, spectral, polarized light, photometric, optical test, and time measurements; optical parts; and special services.

Polyalkylene glycols and derivatives—An attractive 20-page booklet, "Ucon fluids and lubricants," has been prepared by the Special Products Div., Carbide and Carbon Chemicals Corp., 30 E. 42nd St., New York City 17. It discusses in detail the important properties and uses of several series of "Ucon" fluids and lubricants for general industrial lubrication, textile lubricants and conditioners, rubber lubrication, hydraulic applications, plasticizers and softeners, and heat-transfer media.

Adhesives—"A.S.T.M. standards on adhesives," a 48-page booklet on physical tests and definitions relating to adhesives has been issued by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Twelve standards are covered. Two of these include definitions of terms relating to adhesives, and the others are various standardized tests, prepared either by Committee D-14 on Adhesives or D-11 on Rubber and Rubber-Like Materials, which has developed three methods for testing rubber adhesives. Copies of this booklet may be obtained from A.S.T.M. headquarters for \$1.25 each.

Dust and fume eliminator—Schmiege Industries, Inc., 385 Piquette Ave., Detroit 2, Mich., has released a 12-page pamphlet on the Schmiege centri-merge swirl type dust and fume eliminator. Detailed drawings show the design of the various types of eliminators available.

Handling equipment catalog—"Materials Handling Catalog No. 23," containing 86 pages and printed in three colors, has been announced by Lewis-Shepard Products, Inc., 290 Walnut St., Watertown 72, Mass. The cover has a special filing tab for quick visual reference.

Hydraulic presses—The various type of company presses available, their accessories and uses are described in a new 12-page bulletin released by Air-Hydraulics, Inc., 401 Broadway, New York 13, N. Y. Illustrations show the range of work which can be performed with these presses while tabulations list models and specifications.

Plant sites—"Picking a plant site," a 32-page booklet about the Humboldt Bay area of northern California, has been issued by the Humboldt County Chamber of Commerce, Seventh and F Streets, Eureka, Calif. The area's natural resources and advantages are presented with facts, figures, and illustrations.

Plasticizers for vinyl chloride resins—Shell Oil Co., Inc., 50 W. 50th St., New York 20, N. Y., has just released a 23-page brochure on Dutrex 20 and Dutrex 25, plasticizers for vinyl chloride resins. Numerous diagrams show the physical properties of various compounds using these plasticizers. Volatility, compati-

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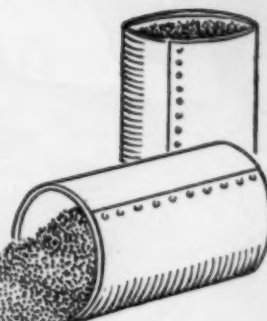
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SINGLE PLATEN ELECTRIC HOT PLATE MOLDING PRESS

Here's a 30-ton hydraulic press that's built for plastic molding and laminating, hobbing, embossing and many other jobs that call for fast, accurate operation. Full pressure is applied quickly and evenly over the 8" X 8" electrically heated platen surface. Accurate temperature control is assured by precise thermostatic control.

Press is completely self-contained—the entire hydraulic system and double acting pump being conveniently housed in enclosed base.

As a result, the operator need

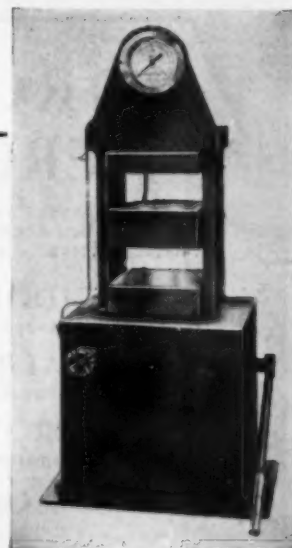
never leave his station or halt press cycle to check readings or make adjustments. Furthermore, it occupies less than 1½ sq. ft. and is suited to bench or floor operation.

DOUBLE PLATEN ELECTRIC HOT PLATE MOLDING PRESS

This 30-ton press is designed specifically where fast easy operation is essential to low cost production and laboratory uses. Noteworthy are its unusual compactness (only 12" X 16" on the floor) and the large, easy-to-read Temperature Indicator. Other features include a large 144-square inch platen surface and heavy all-steel construction.

Available also with motor driven hydraulic power units and with either electrically or steam heated platens, this M & N Electric Hot Plate Molding press is an example of mold machine design at its best.

Both of these presses are available for immediate delivery. Write for complete specifications and prices.



Our engineers are prepared to help you in the selection of the proper hydraulic press for your needs. We can build special presses and supply special equipment for standard M & N presses upon request. Write for our recommendations today.

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JANUARY • 1948

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bility, loss by extraction, electrical properties, and effects of high temperature aging and sunlight are discussed.

Latices—Hycar latices are described in detail in a new technical service bulletin 47-H1 published by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, Ohio, and available upon request. Hycar is a type of butadiene-acrylonitrile copolymer that has found widespread application in the paper and textile industries where the latices have found use in saturation, impregnation, and coating applications. It has been found that impregnation of a low strength paper produces a tough, oil-resistant sheet. These papers are ideal for protective wrapping, gasketing, and many other uses. As Hycar latices are highly compatible with vinyl latices, coatings of the latter can be put on impregnated paper with the Hycar acting as an adhesive. Paper thus processed may find utilization as wallpaper, shelf covering, imitation oil cloth, leather, etc.

Guide to labor contracts—The Society of the Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y., has prepared a comprehensive 224-page book, "A guide to labor contracts for the plastics industry," which should prove of great value to member companies. Assembled in this book are clauses from labor contracts providing for hours, wages, and working conditions and other incidents attending the relationship of employer and employee. These were taken from a collection of over 100 contracts in the plastics industry. Their selection was based on the specific points they represented or for the points they failed to cover. Each clause is analyzed and given a rating of A (desirable), B (fair), or C (unacceptable).

Directory—"Directory of commercial and college laboratories," compiled by the National Bureau of Standards, Washington 25, D. C., completely lists commercial and university testing and research laboratories throughout the country, together with indications of the type of commodities tested. This pamphlet, designated as Miscellaneous Publication M187, may be obtained for 30 cents from the Superintendent of Documents, Washington 25, D. C.

Ethyl cellulose—Two booklets on Ethocel, one entitled "Ethocel data handbook" and the other "Recording lacquers of Ethocel," have just been published by the Coatings Section, Plastic Div., Dow Chemical Co., Midland, Mich.

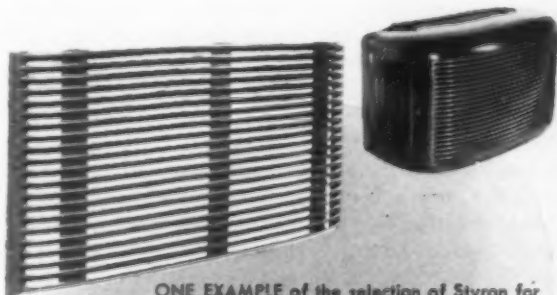
The "Ethocel data handbook" contains information on the basic properties of Ethocel and suggestions for its use in lacquers, emulsions, and hot melts. "Recording lacquers of Ethocel" is the first of a series of monthly bulletins by the Coatings Technical Service on topics of interest for specialty coating applications.

Photographic paper—Eastman Kodak Co., 343 State St., Rochester 4, N. Y., has released an eight-page pamphlet describing Kodagraph Autopositive paper, a silver-sensitized paper for reproducing engineering drawings. Designed for use in normal room illumination with standard blueprint or direct-process printers, this paper produces a high contrast positive copy directly from a positive original.

Synthetic resins—Properties and uses of all Hercules synthetic resins are described in a new technical bulletin released by Hercules Powder Co., Wilmington, Del. Included is a chart which matches the resins with their actual and potential uses. Brief descriptions are given of methyl esters of rosin, ester gums, Cellolyn resins, Flexalyn resins, Lewisol resins, Pentalyn resins, Petrex resins, Poly-pale esters and Staybelite esters.

Centerless belt and contour grinding—Porter-Cable Machine Co., 1714 North Saline St., Syracuse 8, N. Y., has just released two bulletins, one explaining the centerless belt grinding method and the other describing the new method of contour grinding. Both are well illustrated and give advantages of the two methods.

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The Carrier Corporation chose Styron for this louver in their air conditioning units. This louver met requirements for dimensional stability and provided beauty, durability and economy. Its pleasing, strong, unit-design permitted building up grilles for various sized openings from identical basic units.

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1. Styron (Dow Polystyrene) has *low moisture absorption*. It does not swell or warp. Molded pieces of Styron absorb only minute traces of moisture when exposed for long periods to high humidity or complete immersion in water.
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New Machinery and Equipment



Fifty-ton press—For laboratory or small production pressure processing where heat is required, the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has introduced a 50-ton upward-acting hot plate press. A hand lever controls the self-contained hydraulic power unit. Adaptable to either steam or electrical heating, the machine has two 20 by 20 by 1½ in. hot plates for handling laminating and curing work. This press is shown above.

Bushings—A standard line of Meyco carbide-inserted drill jig bushings has just been marketed by the W. F. Meyers Co., Bedford, Ind. A tungsten carbide insert at the two points of wear on each bushing insures longer life and greater accuracy. A hardened steel ring inserted above the top carbide ring protects the carbide and the drill against shock of impact.

Roll feed—Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles 6, Calif., has brought out an automatic friction roll feed which can be applied to the majority of standard punch presses. It can be used for feeding plastic, metal, wood, cardboard, and felt materials. The friction drive provides a feed range of 0 to 3 in. and the unit has a 2¼-in. vertical adjustment for matching any die height within this range. Stock up to 3 in. wide and ⅝ in. thick can be accommodated. Thickness adjustments are made in increments of 0.001 in. by means of a spring-loaded housing. This machine can be operated at 285 strokes per minute.

Pantograph machine—A small size three-dimensional pantograph machine with an exclusive company feature, the Ratiobar, has just been placed on the market by George Gorton Machine

Co., Racine, Wis. This model P13 is designed for light milling of intricate dies, hobs, molds, and stamps. The Ratiobar is an aluminum alloy casting, pivoted horizontally, on which are mounted two hardened and ground steel tracks. The tracer style and cutter spindle float on ball bearings which travel in these tracks. It is therefore possible for the Ratiobar to align the pivot center, cutter spindle, and tracing style in an absolutely straight line. Error is said to be reduced because there is only one slider block to adjust for whatever reduction ratio is desired. Ratios from 2 to 1 to 40 to 1 are obtainable.

The weight of the entire pantograph mechanism is carried by the Ratiobar, and not by the pantograph linkages themselves. Another feature is that as the tracer moves out and away from the pivot center, the pantograph linkages move toward it, thereby, according to the company, maintaining a better balance than on conventional pantographs where the linkages move out with the tracing style.

The machine is adaptable for general two-dimensional light milling and engraving.

Repeat cycle timer—G. C. Wilson & Co., 2 N. Passaic Ave., Chatham, N. J., has announced an electronic repeat cycle timer for process control as well as life testing and laboratory use. Independently variable on and off intervals ranging from 0.1 sec. to 4 min. are available. Wide variations in line voltage have less than 1% effect on the timing intervals. Means are provided for synchronizing the timer cycle with other equipment.

Stamping machine—For stamping names, trade marks, etc., in various colors including gold and silver, the House of Howard, Inc., of Skokie, Ill., has introduced a new stamping machine, Model D-200 Howard Goldpress. This machine, which weighs 35 lb., develops nearly 500 lb. stamping pressure. The type holder will take three or four lines of hand set type, linotype slugs, or dies up to 1 by ¾ inches. The stroke is 2 in. and the stamping depth is 7 inches.

Plunger clamp—A new extra heavy duty plunger clamp, Model 640, is now being produced by Detroit Stamping Co., Dept. K, 327 Midland Ave., Detroit 3, Mich. It is capable of



exerting over 2500 lb. normal pressure in tests. One important feature is that the handle is down when the clamp is closed, making it of value on machines or fixtures where space is restricted. Further, the operating motion is downward and away

from the work. It is readily adaptable to such conversions as light arbor punch and forming presses, for alignment of wood or metal parts in large fixtures, in batteries for laminating of beams or other heavy wood work, or for heavy duty clamping of parts for milling, drilling operations, etc. The clamp is 15¾ in. overall, 3¼ in. high when closed. Plunger travel is 1¼ in. and pressure may be adjusted by turning a ⅝-in. bolt which is in the tapped end.

How to *HANDLE* a Cleaver

ATenite handle coupled with a cutlery-steel blade won this household cleaver a place in the Museum of Modern Art's annual exhibit of "100 Useful Objects of Fine Design."

Tenite is well suited to such modern functional design. It is quickly formed by injection molding, or by continuous extrusion. Finished, it is tough and will stand hard use. Its smooth, splinterfree surface is easy on hands. In addition, Tenite color and luster provide smart appearance.

Tenite is a favored handle material for all sorts of products—including saws, lawn mowers, lanterns, refrigerators, and toothbrushes—and is adapted to many other uses besides. For a 32-page book on Tenite, write TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

Cleaver handle molded for Chas. D. Briddell, Inc., Cristfield, Md., by Franklin Plastics Div., Robinson Industries, Inc., Franklin, Pa.

Information regarding Tenite is obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Leominster, Mass., Los Angeles, New York, Portland, Ore., Rochester, N. Y., St. Louis, San Francisco, Seattle, and Toronto, Canada; and elsewhere throughout the world, from Eastman Kodak Company affiliates and distributors.



TENITE

An Eastman Plastic

The Plasticscope*

INTERPRETATIONS OF THE CURRENT NEWS

BY R. L. VAN BOSKIRK

Fabricated display racks

A potentially important customer for acrylic display racks has reported that most of the samples shipped to him have been broken or fallen apart before he unpacks them. Naturally, he is not impressed with their utilitarian value when they won't hold together. He reports that the trouble is generally at the glue line, especially when curved surfaces are involved. His further observation is that acrylic display racks seem to be satisfactory for lightweight items such as gloves, ties, and handkerchiefs, but that in his experience they come apart at the glue line when items such as drugs, medicines, food, paint, and heavier materials are placed on the shelves.

When this complaint was called to the attention of leading fabricators in the industry, they pointed out that this was just another reason why consumer acceptance was sometimes difficult to obtain; they placed the cause for the trouble in the laps of the less-experienced operators who have not obtained the necessary knowledge to do a satisfactory job.

The problem of obtaining the right adhesive for acrylics is always a matter of fine discrimination, but leading fabricators insist that if ethylene dichloride, acrylic monomer, or a combination of acrylic monomer and methylene dichloride is used for cementing, and if the acrylic is soaked and allowance made for sufficient penetration, one major step toward a good bond has been achieved.

The fabricators also point out that the rack must be properly designed to withstand the weight which it is expected to carry. Furthermore, special attention must be paid to packaging so that the carton itself will not be broken, thus submitting the contents to damage before an article reaches a prospective customer.

Polythene price lowered

Lower prices for Polythene plastic were posted by E. I. du Pont de Nemours & Co., Inc., in November. It was the fifth price reduction in Polythene since manufacture was started in 1943.

For uncompounded molding powder without coloring or for powder compounded in standard colors, the reduction is 4¢ a pound. The previous prices were 50¢ a pound for the uncolored powder and 56¢ for colored material.* For Polythene

* Reg. U. S. Patent Office.

Data book on plastics

"The Plastics Industry—What it buys and how to sell it" is the title of a new data book just published by MODERN PLASTICS Magazine. Its content defines plastics, discusses the physical make-up of the industry, and shows how the industry has grown. Each section of the industry is treated separately and collectively as to productive capacity, growth, potential demands, and buying needs.

Comprehensive data are presented on the geographical distribution of the industry throughout the United States, with comparative figures on the readership of MODERN PLASTICS. Added to this is a complete breakdown of the number of editorial and advertising pages published in all plastics papers since 1934, plus a compact presentation of the editorial scope and collateral services of MODERN PLASTICS.

Prepared to aid in exploring the market potentials of the plastics industry for product or service advertising, this data book is available to all interested manufacturers and advertising agencies.

specially compounded or in non-standard colors, reductions range from 4¢ to 7¢ a pound.

Vinyl prices

In a letter calling attention to changes in the price structure of its products, B. F. Goodrich Chemical Co. announced a reduction in price of Geon polyblends from 45¢ to 42¢ per pound in 30,000-pound lots. The price of latices has also been reduced. However, Geon plastic compounds 1911 and 2046 have been raised in price due to increased labor costs and considerably higher costs of the plasticizers such as dioctyl phthalate, which has increased a total of \$0.063 per pound in price since March, 1946. The recent increase in d.o.p., amounting to \$0.028 per pound, resulted in an increase of Geon plastics of 1¢ per pound.

The company points out that this is their only material on which a price increase has been made during the six years they have been selling vinyl resins, despite about 30% increase in the cost of raw materials such as chlorine and acetylene.

Silicone gaskets

Silicone rubber gaskets that do not adhere to metal, that will withstand temperatures as high as 400° F., and that maintain their original characteristics

under high vacuum are now part of chemical reactors used in the manufacture of G-E Glyptal alkyd resins, according to the General Electric Co., Pittsfield, Mass.

Providing excellent resistance to alcohol, phenol, aromatic hydrocarbons, and other solvents, the silicone rubber is particularly effective for use as a gasket material in the processing of these materials because of the absence of a plasticizer in the silicone rubber stock, according to the announcement. Use of the silicone rubber gaskets in the reactors over many months has proved that they will not harden or crack under severe operating conditions. Further, replacement problems encountered with natural rubber gaskets are eliminated, according to G-E engineers.

Celanese unifies activities

On December 1 the Celanese Corp. of America took over all activities formerly conducted by the various manufacturing and sales subsidiaries of the parent company. The subsidiaries affected are: Celanese Co., Inc.; Celanese Plastics Corp.; Celanese Chemical Corp.; Celanese Export Corp.; Tubize, Inc.; Staunton Textile Corp.; and Bridgewater Textile Corp.

Celanese has been producing materials in seven different states with each subsidiary carrying on separate activities. They are now gathered together under one



What's This... NEW ATOMIC RAY GUN?

Looks that way, doesn't it? And in its own field, it's just as big an advance, too — a *gun-grip* soldering iron, at last! To make it easy to solder, so anyone can do it. A gun grip of *plastic*, of course, to give it lightness, sales appeal, long life! Lenk Manufacturing Company had the idea — *Northern* the facilities, the knowledge and long experience in molding plastics for making the grip. If you use plastic parts — or could, to advantage — see *Northern* and be satisfied. It's the one sure way of keeping up with the times — and ahead!

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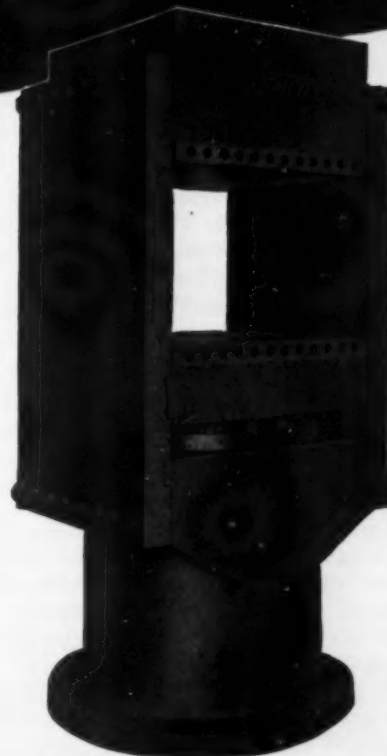
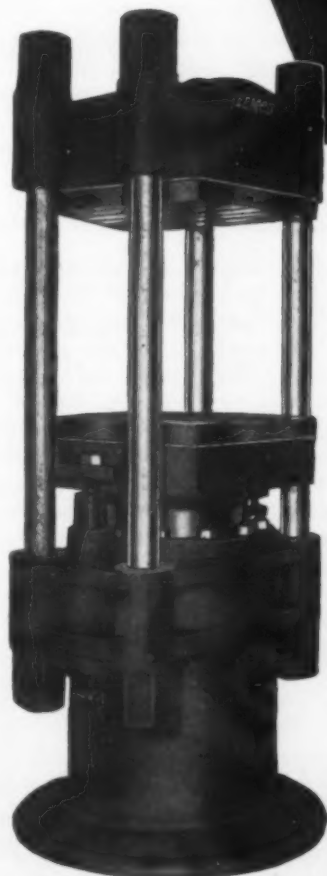
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The Plastiscope

administrative head for purposes of convenience and efficiency.

The company has more or less accomplished the same thing done by Du Pont six or seven years ago when various subsidiaries were placed under the parent company and operated as departments. The various subsidiaries of Celanese are now simply departments of the Celanese Corp. of America, with exactly the same duties and the same personnel as previously. The Celanese Plastics Corp., as a department of Celanese Corp. of America, will continue to handle plastics as always and will be primarily a sales organization for plastics products manufactured by the company.

Tariff concessions

The following products of interest to the plastics industry are included in the list of new tariff concessions agreed to by the United States at Geneva:

Cellulose acetate and compounds, combinations or mixtures in blocks, sheets, rods, tubes, and other forms from 50¢ per lb. to 25¢ per pound.

Casein compounds known as galalith in blocks, sheets, rods, tubes, and other forms from 25¢ per lb. to 12.5¢ per pound.

Phthalic anhydride reduced from 40% ad valorem and 7¢ per lb. to 20% ad valorem and 3.5¢ per pound.

Naphthalene, 79° from 20% ad valorem and 3.5¢ per lb. to 10% and 1³/₄¢ per pound.

Cresylic acid from 20% ad valorem and 3.5¢ per lb. to 10%, 1³/₄¢ per pound.

Metacresol, orthocresol, and paracresol 90% purity from 20% ad valorem and 3.5¢ per lb. to 10%, 1³/₄¢ per pound.

Flocked vinyl film

Hartford Textile Corp., 444 Fourth Ave., New York City 16, has been displaying a flocked vinyl film that has aroused considerable interest. The material, called Beutafilm, is a 0.004-in. gage vinyl to which is attached rayon flocking by means of a specially compounded adhesive. Clear cut patterns are executed by means of roller engravings which are made with a special technique in order to deposit the proper quantity of adhesive to obtain good adhesion. The flocked material is used for boudoir curtains, vanity table skirts, and aprons.

New forest product group

The first national meeting of the Forest Products Research Society was held in Chicago recently. Three technical sessions at the meeting covered chemical

utilization of wood, engineering aspects of wood use, and seasoning and preservation of wood. Subjects were post-war packaging; lignin chemistry problems; new functional furniture; developments in glues; and metal-to-wood bonding.

The society was founded "to cover the fields of research, development, production, or utilization of forest products by facilitating the interchange of information, abstracting results, publishing information, encouraging cooperation, providing test methods and procedures, sponsoring meetings, and, in general, encouraging and promoting the efficient utilization of wood and other forest products."

President of the organization is Fred W. Gottschalk, technical director, American Lumber & Treating Co.

Permanent valve packing

Fabricated from 100% unoriented Teflon, a chemically inert, anti-adhesive, and easily deformable valve packing called Chemiseal #510, is now available from United States Gasket Co., 610 N. 10th St., Camden, N. J. The packing is inserted into valve stuffing boxes in the form of a sleeve or bushing and with low nut pressure flows to the dimension of the stuffing box.

Being chemically inert, Chemiseal #510 does not require replacement; anti-adhesive characteristics of the material eliminate freezing and binding of valve stems and reciprocating shafts, and minimum operating force is required on the spindle.

Plastic-wire fabric

A new process for the manufacture of wire fabrics has been developed by Raymond S. Southwell, Unity Road, Nichols, Conn. Formerly sales manager of the Campbell Div. of American Chain & Cable Co., Inc., Mr. Southwell resigned his position to devote his time to the new process. It involves equipment of new design that will make an unwoven fabric of wire bonded together with plastic which welds the joints and protects the wire against corrosion.

Large plastic tubing

Ability to produce thermoplastic tubing in diameters up to 10 in. or more is announced by Carter Products Corp., 10225 Meech Ave., Cleveland, Ohio. Such tubing is held to close tolerances of both inside and outside diameter.

The production of large diameter plastic tubing opens up many possibilities for

users in various fields. Because of its close tolerances, applications of this type of tubing include vacuum cleaner housings, textile field uses, in oil refining and processing equipment, and decorative uses such as lamps and columns.

German tool making

Synthetic molding operations in Germany, with emphasis on tool making and care, are the basis of a study prepared for the British Intelligence Service and now available in the United States from the Office of Technical Services, Dept. of Commerce, Washington, D. C. The title of PB 60394 is "Some German synthetic resin molding plants"; photostat, \$4; microfilm, \$1. Orders should be accompanied by check or money order made payable to the Treasurer of the United States.

New use for Kriston resin

Now being used as a bonding agent for phenol-formaldehyde resin handles on cutlery, Kriston resin is replacing the previously used litharge-glycerin cement, according to information received from Ekco Products Co., Chicago, Ill. Low shrinkage during cure makes Kriston resin unique for this purpose, according to the company, and provides a bond stronger than the older type cement. Moreover, when a litharge-glycerin bond is broken, the cutlery handles are easily removed; with Kriston, a 100-lb. pull is necessary to separate the elements even after the bond is ruptured. Other advantages of the synthetic resin are that it is not sensitive to humidity and is highly resistant to boiling water and fruit acids. It can also be used for bonding wood, glass, and bone handles to metal.

Phenolic bushings

A line of insulating conduit-end bushings made of Bakelite BM-49 diced phenolic molding material has been introduced by the Union Insulating Co., Inc., Parkersburg, W. Va. They claim these bushings eliminate a serious source of shorts and grounds in electrical wiring. The new plastic bushings feature uniform, smooth, concentric threads and smooth inside lips entirely free of burrs. In addition, they are ribbed like metal bushings, facilitating installation by hand or tool.

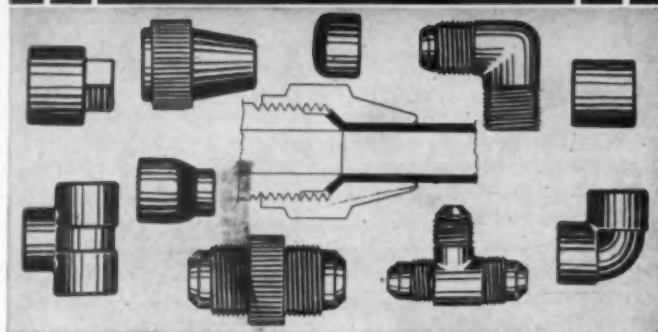
The bushings are being compression molded in multiple cavity molds, in contrast to their former manufacture, at a higher cost, from machined laminated tubing. The material is an excellent insulator, and the developers claim separate insulating parts are unnecessary.

Urea standard colors

The Plastic Material Manufacturers Assoc., Inc., and the Commodity Stand-

Design Hints

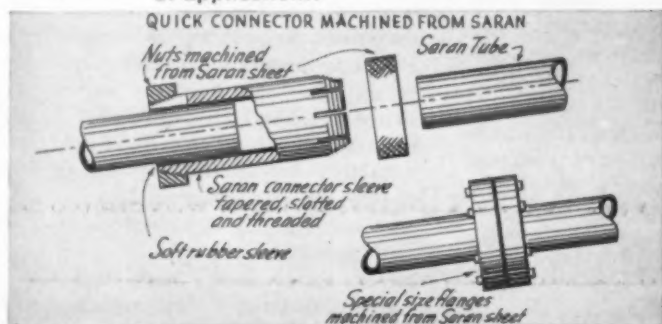
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FLARED FITTINGS make possible any hook-up required for corrosion-resistant lines for cooling water, coolants, chemicals, hydraulic controls, electrical conduit.



FORMED TUBING — ACE Saran can be formed much the same as metallic tubing for a wide variety of applications.



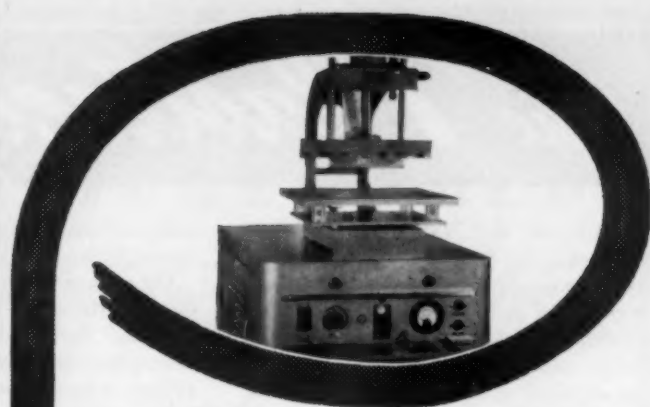
MACHINING SARAN SECTIONS — Many times it's more economical to machine parts from standard sections than to make molding dies. Consult ACE.

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The Plastiscope

ards Div. of the National Bureau of Standards, U. S. Dept. of Commerce, have announced a commercial standard for colors for molded urea plastics, known as Commercial Standard CS147-47, which became effective Dec. 15, 1947. Seventeen standard colors have been adopted, after a two year investigation and study in the trade, as being most widely used. The new standard defines the colors in reproducible terms, specifies tolerances, and provides for standard samples and designations to be used by all segments of the industry. Standard samples of the colors are available from the PMMA, Rm. 731, Tower Bldg., Washington 5, D. C., in sets of 17 colors for \$2.50 per set, remittance to accompany order.

Other colors will also be supplied customers when the amount involved warrants such runs.

Plastics education

Educational needs of the plastics industry were discussed at the first meeting of the Education Committee of the S.P.E. at Princeton University recently. The Committee hopes to develop a program for the guidance of institutions interested in establishing plastics curricula and has formulated basic principles of an engineering education at the professional level. They concluded that a thorough training in engineering fundamentals precludes specialization in plastics in the time normally required to obtain a B.S. in engineering and recommended that specialization in plastics be concentrated at the graduate level.

The Committee hopes to consider the specific educational needs of the industry and plans to develop a program of study to meet these requirements.

The Education Committee is under the chairmanship of Professor L. F. Rahm, director of Princeton's plastics program, and equally represents industrial and educational leaders in the field of plastics.

Plastics Pioneers

The reorganization committee recently appointed for the Plastics Pioneers met in a two-day session in November at Buffalo. Mr. Alan S. Cole of MODERN PLASTICS Magazine was appointed chairman and a complete constitution and set of by-laws was drafted, placing the Pioneers organization on a permanent and substantial basis.

It is understood that the by-laws are now going through revision and legal inspection, and that they will shortly be offered to all the Pioneers for their consideration at a meeting which will be

called before, and in conjunction with, the annual Spring meeting of S.N.P.I.

Other members of the committee are: Garson Meyer of Eastman Kodak Co.; Nicholas Backsheider of Recto Molding Co.; Herbert Spencer of Durez; and George Johns, formerly of American Insulator Corp.

Deterioration

War-time research for the prevention of deterioration of optical instruments, textiles, synthetic resins, plastics, photographic equipment, and other material in tropical climates is summarized in a report now on sale by the Office of Technical Services, Dept. of Commerce. The research was carried out by the tropical deterioration administrative committee of the Office of Scientific Research and Development.

For example, an adequate method for controlling fungus growth within optical instruments was developed. The method consists of applying a mixture of 50% of the fungicide "Cresatin" (metacresyl acetate) and 50% ethyl cellulose enclosed in a small aluminum capsule with minute openings. The capsule is cemented within the instrument out of the path of the light rays. Under drastic conditions in the Panamanian jungle the capsule prevented deterioration for 21 months.

The report summarizes results of tests on flying clothing, airplane fabrics, shoes, filter papers, sheet insulating materials, plastic terminal strips, paper pads, spray coatings, glass cord plastics, hookup wires, lenses, felt, and other materials. Orders for the summary report PB 81801, "Tropical deterioration of equipment and materials", mimeographed, \$3.50, should be addressed to the Office of Technical Services, Dept. of Commerce, Washington 25, D. C., accompanied by check or money order made payable to the Treasurer of the United States.

Plastics clinic

A two day meeting devoted to the molding and fabrication of plastic materials is being sponsored by the New York State Dept. of Commerce, sessions to be held in the main auditorium of the Engineers Bldg. in New York City on January 21 and 22.

The clinic is designed to acquaint New York State's industry, especially those smaller units with inadequate research facilities of their own, with recent developments in materials, processing techniques, and products developed through industrial research. It is jointly sponsored by the

Dept. of Commerce and Brooklyn Polytechnic Institute.

Specialists from various plastic material fields will talk informally on the principal characteristics of each material and process.

Admission is by invitation only, and about a thousand of these have been mailed to individual firms within the State. Those not receiving an invitation and wishing to attend can secure an invitation by writing the New York State Dept. of Commerce, Bureau of Industry, 112 State St., Albany, N. Y.

Better testing

More durable plastics and more elastic rubber are promised by a new microscopic technique utilizing color photographs, Professor Ernst A. Hauser of Massachusetts Institute of Technology declared at the Northeastern Section of the American Chemical Society. He said that the ultra-microscope has succeeded where the electron microscope failed in revealing what changes take place when a material is stretched, vulcanized, or chemically treated.

With an ultra-microscope, scientists can inspect enlarged and sharply defined reflections of tiny particles of rubber, soap, plastics, and other materials too small to be visible under an ordinary microscope, he explained, pointing out that color film, because of its extremely fine grain, is ideally suited to photographing what the ultra-microscope reveals.

Simplified data needed

At the recent S.P.E. Chicago Section meeting, William Bracken of Hercules Powder Co. spoke on test data showing how high acetyl cellulose acetate could be formulated to meet service requirements. Following his talk there was a spirited discussion about the need for an over-all source of reliable information on characteristics of various molding materials and their suitability for specific end use applications. The raw materials manufacturers were criticized for the complex and often confusing information included in their multitudinous data sheets and other technical material. Molders claimed that they are constantly confused and find it difficult to get a clear understanding of the exact specifications and characteristics of the material which is offered for sale.

Wall covering

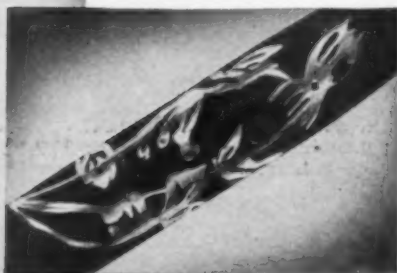
A vinyl plastic wall covering called Sana-Wal has been put on the market by the Sandura Co., Inc., Philadelphia, Pa. It assertedly has many of the advantages of tile but is applied like wallpaper and can be hung by any paper hanger without special adhesives or tools. Company officials claim it has the permanence,

BRIGHT with GOLD - - LIGHT to HOLD - - QUICKLY SOLD!



◆ Sinuous gold leaf design adds beauty to dark brown plastic surface of this attractive pencil. Pattern adheres permanently—even to sharply curved surfaces like this one. Pencil decorated for Ritepoint Co., St. Louis, Mo.

Close-up of decoration. The G. M. C. process will also give quality appearance to compacts, cigarette cases, novelty jewelry, eyeglass frames, buttons, etc.



Here's how you can enrich your plastics products with gold or silver—combine the light weight of plastics with the lustre of precious metals—and make your product a sure-fire seller!

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cleaning ease, and decorative appearance of tile without the difficulties of application. Like other plastic wall coverings, it is impervious to stains and grease and can be cleaned with soap and water.

Phoresin

Victor Chemical Works, Board of Trade Bldg., Chicago, Ill., has announced that the name of its plastic material originally called V-Lite has been changed to "Phoresin." The specifications of the product remain unchanged, its chemical name being diallyl benzene phosphonate, a colorless liquid in its original form that sets to become a hard, strong, and transparent resin.

The new plastic has unique flame resistant properties and a high refractive index. It is thermosetting and is insoluble in most chemicals. When combined with other plastic materials it forms hard and brilliant resins (copolymers) and can be used with glass fabrics to make transparent laminates of great strength.

Pyroxylin coated materials

Total amount of pyroxylin spread in the first nine months of the last three years is as follows, according to the Dept. of Census figures:

	1945	1946	1947
Pyroxylin spread, lb.	41,000,000	57,000,000	52,000,000
Value \$	19,000,000	33,000,000	39,000,000

Total linear yards of fabric spread with pyroxylin generally ranged between 6,000,000 and 8,000,000 monthly for 1946 and through 1947 up until June and July.

Record month for all pyroxylin spread during the last three years was in Jan. 1947, with 7,700,000 pounds. It dropped to 4,100,000 in July 1947, but July has always been a low month. Most months in 1947, except for the record-breaking January and February, ran about the same as 1946.

There is considerable interest in these figures because some of the coating and calendering processors are wondering just where all this pyroxylin was used. Insofar as we can find out, a great portion of it has gone into book binding, luggage and case goods, trim for automobiles, and to some extent into summer furniture. A great deal of this volume is credited to big orders that came in immediately following the war because practically all items in these categories had been exhausted.

Holding present markets—Pyroxylin coaters claim that it will continue to hold many of its present markets such as coated fabric coverings for low-cost radio

cases and portable phonographs, for vacuum cleaner cylinder covers, and for a great portion of the flat work in automobile upholstery where it has just as good or better abrasion resistance for side panels and trim as any other material. They expect it to hold the bookbinding market until problems of adhesion, printing, and gold stamping with vinyl coated fabrics are more completely solved. The summer furniture upholstery market now in pyroxylin may not hold up as the plastic conscious consumer is asking for "plastic" coatings.

These same pyroxylin processors are willing to concede that the pyroxylin market for ladies' handbags, footwear, and many upholstery applications and miscellaneous household furnishings is threatened by the vinyls.

There is still considerable competition between the two materials in the upholstery field for dinette chairs where unsupported vinyl sheeting is moving rapidly into the picture.

Price factor—The important price factor which pyroxylin coaters thought might give this material some advantage has been largely dissipated. In many cases, there is only 3 cents a sq. yd. difference between the best grades of coated vinyl and pyroxylin.

RUMORETTES

Nalle Plastics, Inc., Austin, Texas, is reported to have developed a plastic wall tile with acoustical properties that will aid in soundproofing a room.

Two years ago there was talk about manufacturing men's shirts with a thermoplastic adhesive process rather than sewing. The idea was to cut costs on a mass production basis. Nothing has been heard of the process since that time, but investigation reveals that the idea is practical insofar as the adhesive is concerned. Developers have laundered experimental swatches more than 30 times, and no ill effects have been noted. The catch is that no one has yet been able to develop a machine whereby the shirts can be glued in a continuous manufacturing process.

The chemical industry is flirting with a promotional idea similar to one already used by the agricultural and petroleum industries. It would consist of large mailings to high schools, presenting various charts and printed literature giving interesting details and explanations of the contributions that the industry makes to the country's national and family in-

come. The literature would be designed to be used in class work by high school seniors as a type of long-term promotion for the chemical industry.

The plastics industry might well look into such a program. It is understood that the same promotional material could be used for sales groups or other interested individuals as well as for students.

RAW MATERIALS

NBS casting resin is now being manufactured by the Mathieson Alkali Works, 60 E. 42nd St., New York N. Y., in commercial quantities. Essential ingredient in the formula is dichlorostyrene, a monomer produced by Mathieson. The company can supply either a dichlorostyrene-copolymer, for those preferring to mix their own resin as needed, or the formulated resin ready to be poured after the addition of a small amount of catalyst. The liquid resin is said to have satisfactory keeping qualities, especially when stored at low temperatures.

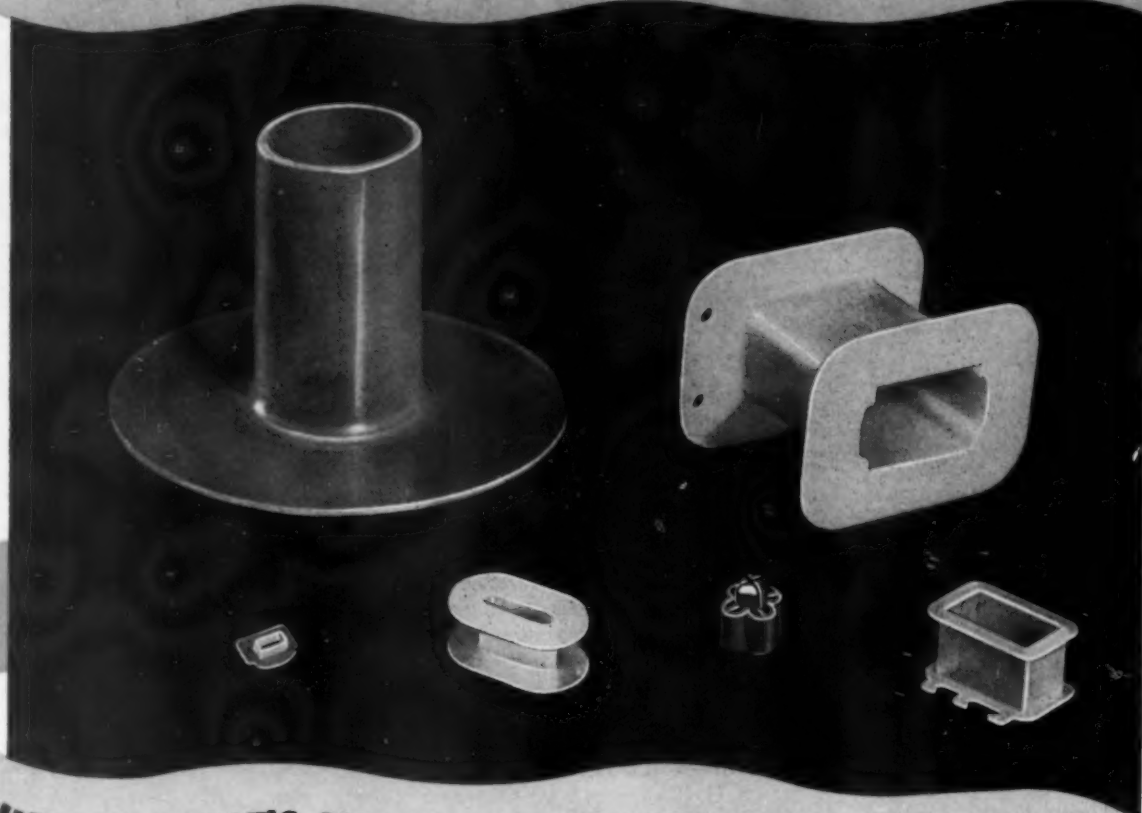
The properties of the casting resin recently announced by the National Bureau of Standards include low power factor, low dielectric constant, short polymerization period, small volume shrinkage on polymerization, high impact strength, electrical and dimensional stability, and low moisture absorption.

The resin was a war-time development for use in the radio proximity fuse and other small electrical assemblies. It is expected to find application in heavy industry, such as steel mills and plating plants, for protecting high-impedance control devices from fumes, high humidity, and mechanical damage. Other possible uses are in potting sub-assemblies for radar equipment, hearing aids, portable radio transmitters and receivers, and sub-miniature electronic devices.

Gladite, a new cold molding material, has been announced by the Myler Plastics Corp., 92 Bishop St., Jersey City, N. J. Its use for model building bricks was described in the December MODERN PLASTICS. It is an inorganic material which does not contain asphalt and has many advantages over other cold molding materials, according to the announcement. It can be obtained in ivory, black, brown, bright and dark red, blue, buff, and green; even pastel colors can be matched. The specific gravity is around 1.73 in comparison with other Myler cold molding compounds at 1.97. The bulk factor of this new material is 2 and 2/4 to 1, in comparison with 3 and 3/4 to 1 in their other materials. Also in comparison with their other materials, the Myler people point out that Gladite requires no baking cycle; is bright in color instead of dull; has good flow; and contains almost no gritty materials, limiting mold wear.

The company is inviting experimenta-

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**It's to Your Advantage
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KNOW-HOW in Custom Molding Nylon**



HAVE you checked with Erie Resistor, the oldest commercial molder of nylon, regarding the advantages to be gained for your product in the unusual properties of this plastic? Years of experience have given us intimate knowledge of the behavior of nylon in every stage of the molding process, and enable us to produce custom molded components that are correct in every detail. The unusual shrinkage factors inherent in

nylon are accurately controlled and close tolerances maintained.

The assortment of coil forms shown gives some indication of the versatility of nylon when the molding job is assigned to Erie Resistor. We are also working on nylon gears, bearings, bobbins, etc., to be custom injection molded to customer's requirements. It's to your advantage to make use of Erie Resistor's know-how and experience.

Plastics Division

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tion and will send a sample cannister to authorized applicants. They point out that the cold molding material is now used for such products as checkers and fuse plugs, and that one order for 300,000,000 liquor bottle flanges has recently been received. Molding speed runs from 1,000 to 30,000 pieces per hr., depending on the size of the item.

Chlorinated paraffins being produced by the Hercules Powder Co. under the trade names Chlorafins 42 and 70, liquid and solid respectively, have exceptionally good chemical stability. According to a news bulletin put out by Hercules, chlorinated paraffins are being used in an increasing number of industrial applications where their high chlorine content, their plasticizing action, and other special properties are of value.

Chlorafin 42 can be used, the announcement states, as a low-cost plasticizer in pigmented vinyl coatings for cloth and metal. Chlorafin 42S, according to Hercules tests, appears to be effective as a plasticizer for vinyl plastics, especially when blended with dioctyl phthalate. A Hercules evaluation of Chlorafin 42S, dioctyl phthalate, and combinations of the two plasticizers showed that gloss improved and flexibility decreased when the Chlorafin content was increased.

COMPANIES

High Vacuum Coating Corp., 55 Sudbury St., Boston, Mass., a newly organized firm, is now engaged in the application of metallic coatings under high vacuum. The company uses a highly developed technique to apply a variety of metal films to plastics, glass, and other materials for use in automotive parts, costume jewelry, vanity cases, mirrors, lamp reflectors, etc. Low-reflection surface coatings may also be applied to optics by the process.

The Glen L. Martin Co. has shortened the name of its Plastics and Chemicals Div. to Chemicals Div., in the interest of brevity and greater accuracy.

Chemicals Div. headquarters and Technical Service Laboratories are at Baltimore, Md. The Div.'s plant, which will have an ultimate capacity of 25,000,000 lb. of Marvinol resin annually, is nearing completion at Painesville, Ohio.

The B. F. Goodrich Co. has announced the following appointments to their recently created Plastic Materials Sales Div.: E. L. Byan is mgr. of sales for coated fabric, calendered sheet, and coated wire products; William M. Gas-

ton is mgr. of distributors' sales; R. L. Hill is mgr. of sales for extruded and molded products; and N. P. Singleton is mgr. of sales for cast and calendered film, coated paper, and packaging material.

Reynolds Research Corp.'s Gary, Ind., plant has been acquired by Reynolds Metals Co., and will be operated as the Plastics Div. of the Reynolds Metals Co.

Saran Lined Pipe Co., Stephenson Bldg., Detroit, Mich., has been recently organized and will act as exclusive distributor for the Dow Chemical Co.'s specialty pipe and fittings. The pipe and fittings, lined with Saran, were recently developed for use where highly corrosive materials are handled in manufacturing processes. They are expected to be of special use in the fields of metal processing and plating and in chemical, pulp, paper, and synthetic textile manufacturing. Chemical resistance, ease of fabrication, immediate delivery, and reasonable cost are among the pertinent advantages of the new product, Dow reports.

S. H. Blackmore is sales manager of the Saran Lined Pipe Co. and plans to establish sales representatives and jobber outlets throughout the country for the pipe and fittings, which are now in production at Dow's Midland plant.

Monsanto Chemical Co., St. Louis, Mo., has filed a registration statement with the Securities and Exchange Comm. covering an issue of 250,000 shares of cumulative preference stock, series B, carrying a \$4.00 dividend rate.

The stock was offered to the public last month through an underwriting group headed by Smith, Barney & Co., New York City, at a price fixed by the Board of Directors of Monsanto. The stock will be redeemable during various periods at fixed premium prices.

The proceeds of the issue will be used for the general corporate purposes of the company, including its expansion program. During 1946 approximately \$23,500,000 was expended on capital additions and plant expansion, and approximately \$27,000,000 was expended for the same purposes during the first nine months of 1947. The company contemplates a continuation of such expenditures.

The Providence Custom Molding Co., Inc., 690 Central Ave., Pawtucket, R. I., a recently organized firm, has announced it is now equipped to injection mold all thermoplastic materials, including nylon and vinyls.

The company offers engineering, design, consulting, assembling, and packaging services. Mold construction will be

undertaken whenever necessary. The plant is operated by C. E. Buote, who acts as vice-president and general manager of the company.

Numar Products Co., Inc., Cincinnati, Ohio, will specialize in a variety of plastic items for distribution nationally. The company has planned production of plastic coating for baby shoes, a process previously handled only in metallics. Robert Lipps is executive vice-president and will be in complete charge of all manufacturing operations.

General Chemical Co. has announced its merger with its parent company, Allied Chemical & Dye Corp. Business will be conducted under the name General Chemical Div., Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y. No change in management or personnel is involved in this merger.

L. T. Swallow & Associates, Boulevard Bldg., Detroit, Mich., have been appointed sales representatives covering the state of Michigan and Toledo, Ohio, for Celluplastic Corp., 50 Avenue L, Newark, N. J., injection and extrusion molders and large producers of plastic containers.

Calco Chemical Div., American Cyanamid Co., has completed and put into operation the first production unit of their new Willow Island, W. Va., plant. A second large unit is scheduled for operation this month. All construction work and installation of equipment for the current program is expected to be completed by early spring.

The management of the Willow Island plant of Calco is conducted by D. H. W. Felch, plant manager, J. W. Dykes, production manager, and R. C. Lantz, personnel manager.

Rogan Brothers, compression molders and branders of plastics, have moved from 2001 S. Michigan Ave., Chicago, Ill., to new, larger quarters at 2500 Irving Park Blvd., Chicago 18, Ill.

Columbus Plastic Products Co., Inc., Columbus, Ohio, is now "at home" in its new location at 1625 West Mound St., Columbus, with increased floor space, additional die making facilities, molding equipment, and modern production finishing departments. The new plant provides over 50,000 sq. ft. of floor space.

Among the many improvements is a die shop permitting the making of dies to individual design, engineering, and mold specifications. An experimental laboratory adjoins it to help eliminate costly production tie ups.

Production is devoted to both custom molding and manufacture of a complete line of housewares items.

Niacet Chemicals Div., a unit of Union Carbide & Carbon Corp., is now erecting at Niagara Falls, N. Y., a new vinyl acetate unit which will materially

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The problem of light engineering posed by the Montgomery Ward and Company Airline Radio Dial, became very simple and economical after applying Felsenthal methods and experience.

First, a crystal clear transparent acrylic was chosen to produce outstanding edge-lighting—and provided sharp detail and ease of legibility to translucent white screened letters.

Next, Felsenthal, as a result of years of experience in the problems of light-absorption and reflection, advised the use of a harmonizing light tan shade instead of the original choice of mahogany brown. Thus, brilliant lighting and rich color contrast to the cabinet were gained.

The Airline Radio Dial is just another example of the gratifying results you may expect from Felsenthal's vast experience in light engineering.

Another new Impco combination injection-compression press with a molding capacity of 22 oz. has recently been added to our equipment.

ANOTHER IN A SERIES OF

Case Histories

IN WHICH

**FELSENTHAL TAKES IT
FROM BLUEPRINT TO
PRODUCT IN PLASTIC**

FELSENTHAL PLASTICS

INJECTION MOLDING • LAMINATING • FABRICATING

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Ask, on your letterhead for our NEW
booklet No. 7 "FELSENTHAL PLASTICS"



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increase its production capacity. The new unit is expected to be put into operation this month.

Plastic Printing Corp. has moved to new and larger quarters at 239 E. 56th St., New York City. Additional equipment installed includes a five-color press.

Plastic Engineering, designers and manufacturers of thermoplastics, has moved from 152 S. Second St., Lindenhurst, L. I., N. Y., and announces the new location of its office and plant as Great Neck Rd., Copiague, L. I., N. Y. This firm is doing some unique work in drawing and blowing plastics.

PERSONAL

George W. DeBell, plastics consultant, has moved his business from 1380 Bedford St., Stamford, Conn., to P. O. Box 66, East Chatham, N. Y.

Sidney Emsig of Emsig Manufacturing Co. was elected chairman of the Thermosetting Button Section of the Society of the Plastics Industry. This section is now considering the National Institute of Cleaning and Dyeing button tests and examining ways and means of strengthening the competitive position of thermosetting buttons. A committee has been named to investigate and report on the matter of a joint sales promotion with specific emphasis on the use of informative labeling for button packaging.

L. R. Blackhurst, Jr., has been named manager of the Philadelphia district office of E. I. du Pont de Nemours & Co., Inc. He succeeds R. M. Horsey, who resigned to become executive vice-president of the Orange-Crush Co., Chicago.

Dr. William C. Dearing has been named director of research of Plaskon Div., Libbey-Owens-Ford Glass Co. Since 1945 he has been associate director of research for Plaskon, covering the general fields of molding materials, industrial resins, adhesives, and coating resins.

Harry D. Myers has been appointed to the position of executive vice-president, director, and general manager of the eight plants of the Standard Products Co., 19255 W. Davidson, Detroit, Mich. Mr. Myers was previously with Thompson Products, Inc., of Cleveland, Ohio, and more recently with Harry Ferguson, Inc., Detroit, Mich. The Standard Products Co. manufactures automotive parts, vending machines, molded plastics, and automotive window channel and weatherstripping.

N. J. Rakas has resigned as General Manager of the Fisher Plastics Corp. at Newton, Mass., and is now associated with National Automotive Fibres, Inc., Detroit, Mich., where he is in charge of research and development of plastic and synthetic fibres.

Joseph Lupo has severed his connections with Lupomatic Industries but retains the presidency of Lupomatic Tumbling Machine Co., Inc. Mr. Lupo will also operate as a free-lance consultant on assembling and finishing plastics, under the name Joseph Lupo and Associated Engineering Co., which is located at 3636 Park Ave., New York, N. Y.

William I. Burt, vice-president of B. F. Goodrich Chemical Co., Cleveland, Ohio, was elected a director of the American Institute of Chemical Engineers.

Charles H. Gant, manager of the Hercules Powder Co. Parlin, N. J., plant, has been named manager of ethyl cellulose promotion for the company's Cellulose Products Dept. He has transferred to Wilmington, Del., to take over his new duties. William H. Morrison, formerly assistant manager of the Parlin plant, has replaced Mr. Gant as plant manager.

Paul C. Pocock, formerly vice-president in charge of sales of the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, was elected executive vice-president and general manager at the recent meeting of the directors of the company. At the same meeting, Walter G. Tucker was elected chairman of the board. Warren R. Tucker, who has been vice-president of Commonwealth Engineering Co., Dayton, Ohio, was elected to fill the newly created post of vice-president in charge of engineering and research.

Edmund Greene has been named sales promotion and advertising manager of the Merrimac Div. of Monsanto Chemical Co.

Carleton Ellis, Jr., has been promoted to the post of director of purchases for the Plaskon Div. of Libbey-Owens-Ford Glass Co., Toledo, Ohio. At the same time, appointment of Lester L. Bauer as assistant chief engineer on the engineering staff of Plaskon was announced. Mr. Ellis was formerly Plaskon's district sales manager of the Chicago and Washington offices and more recently manager of the plant's new products dept. Mr. Bauer until recently was plant engineer with the Proctor & Gamble Mfg. Co. in Dallas, Texas.

L. N. Harrison, southeastern district manager of the Votator Div. of the Girdler

Corp., Louisville, Ky., has moved his headquarters from Charlotte, N. C., to 505 Forsyth Bldg., Atlanta, Ga.

M. S. Carr has been appointed divisional purchasing agent for the Closure and Plastics Div. of the Owens-Illinois Glass Co., Toledo, Ohio. Mr. Carr has been associated with the organization for 24 years.

John C. Robb, American Molding Co., San Francisco 5, Calif., was elected president of the newly formed Golden Gate Chapter of the Society of Plastics Engineers at the S.P.E. national meeting recently. Vernon C. Rollins of Monsanto Chemical Co. was named vice-president, and Clark Robinson, secretary-treasurer.

T. Norman Willcox has been appointed manager of the Methods and Equipment Laboratory, Plastics Div., Chemical Dept. of the General Electric Co., Pittsfield, Mass.

B. J. C. van der Hoeven has been named assistant general manager of the Chemical Div. of Koppers Company, Inc., Pittsburgh, Pa. The position is newly created in the expanding Chemical Div.

Deceased

B. J. Smith, president of Breyer Molding Co., 2536 W. Lake St., Chicago, Ill., November 12.

Arthur L. Pulfrey, director of personnel relations at National Starch Products, Inc., New York, N. Y., October 30.

Edwin Madison Allen, formerly president and chairman of the board of the Mathieson Alkali Works, Inc., New York, N. Y., November 2.

Erwin O. Freund, president of the Visking Corp., Chicago, Ill., November 12.

Harold B. Gaylord, Philadelphia sales manager for the Carpenter Steel Co., November 26.

MEETINGS

January 12-16, inc.—National Materials Handling Exposition, Public Auditorium, Cleveland, Ohio, featuring topics of interest to the plastics industry.

January 21-23—S.P.E. National Annual Conference to be held at the Horace H. Rackham Educational Memorial, Detroit, Mich.

February 16-17—S.P.I. of Canada at Mt. Royal Hotel, Montreal, Que.

April 26-30—Annual Packaging Exposition, Cleveland, Ohio.

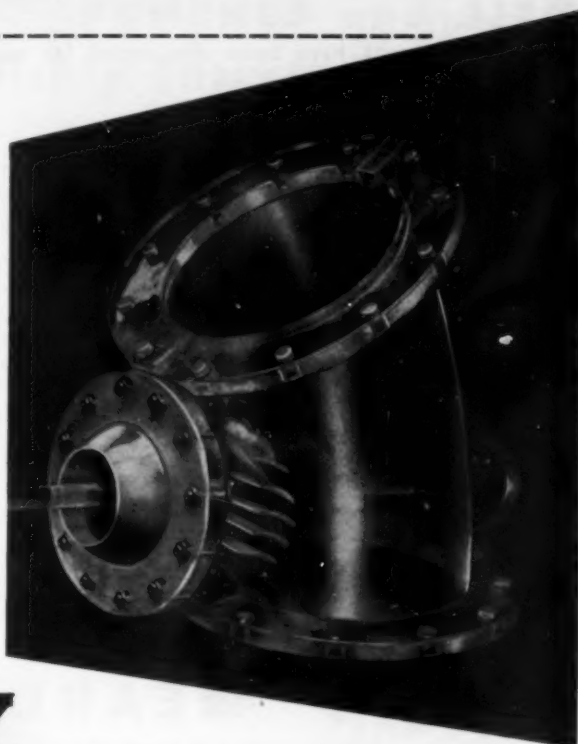
September 27-October 1—Third National Plastics Exposition and S.P.I. Conference to be held at Grand Central Palace in New York City.

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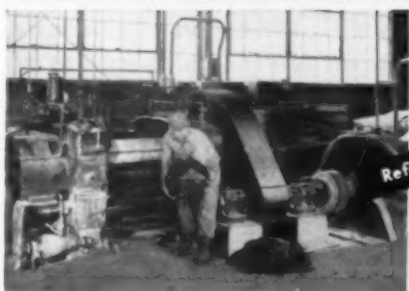


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Advances in plastics

(Continued from page 120)

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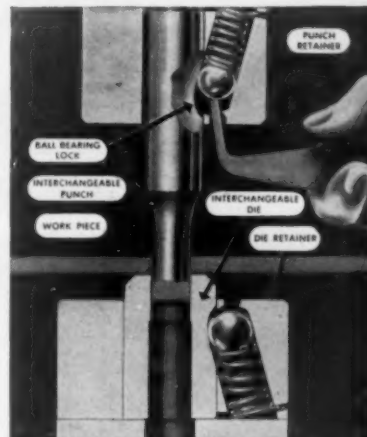
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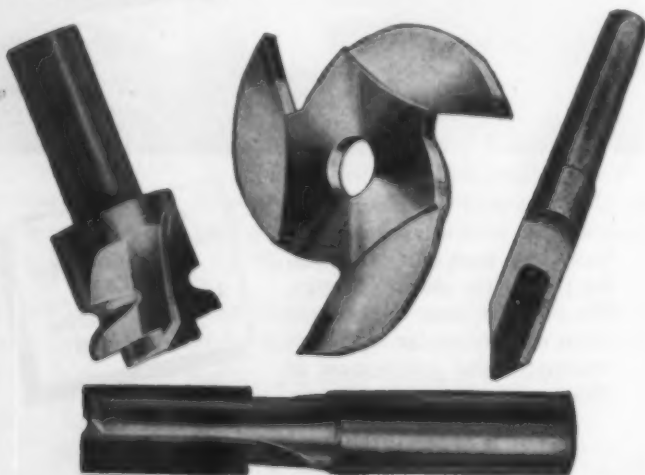


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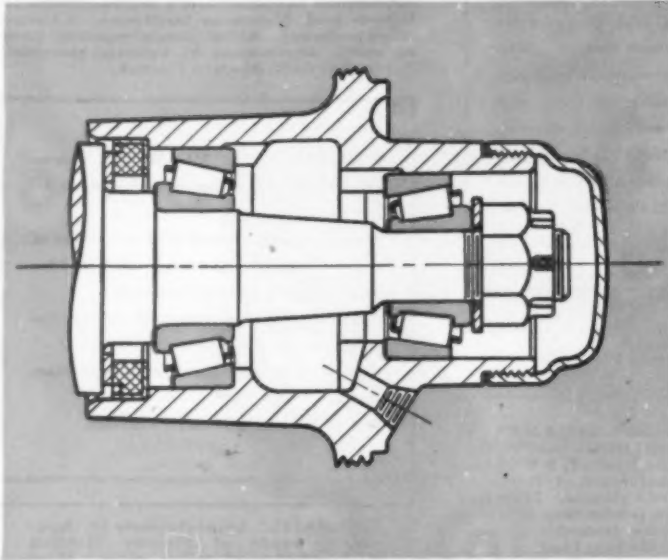
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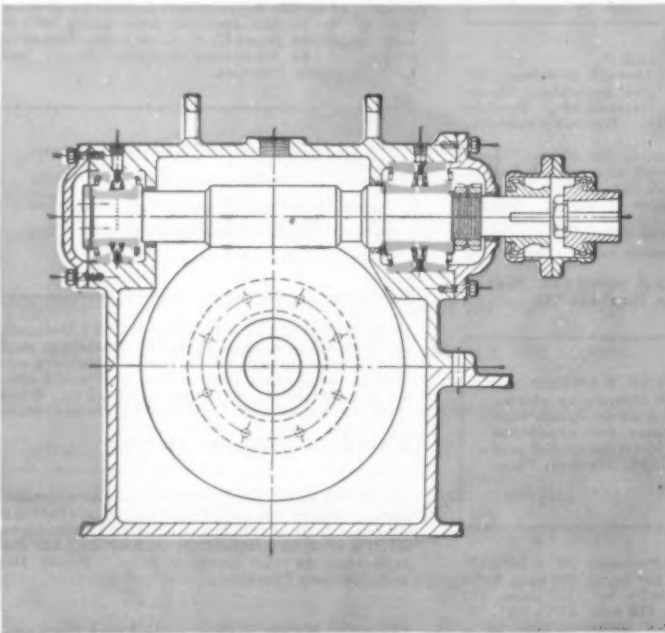
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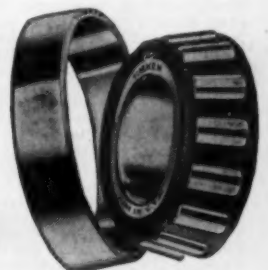
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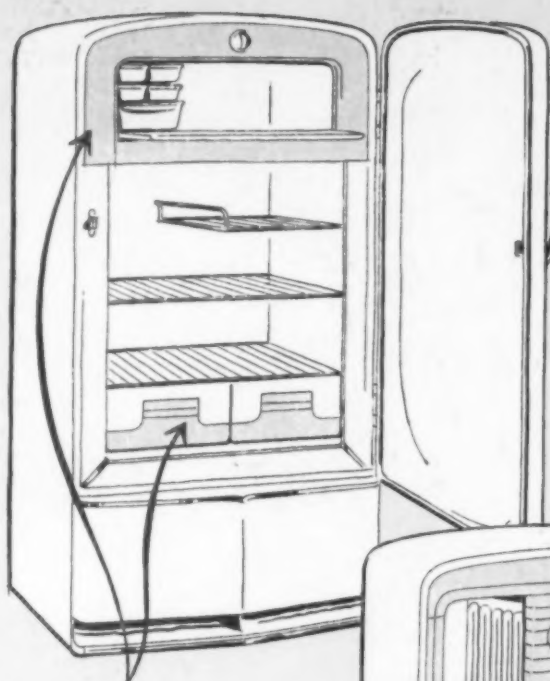
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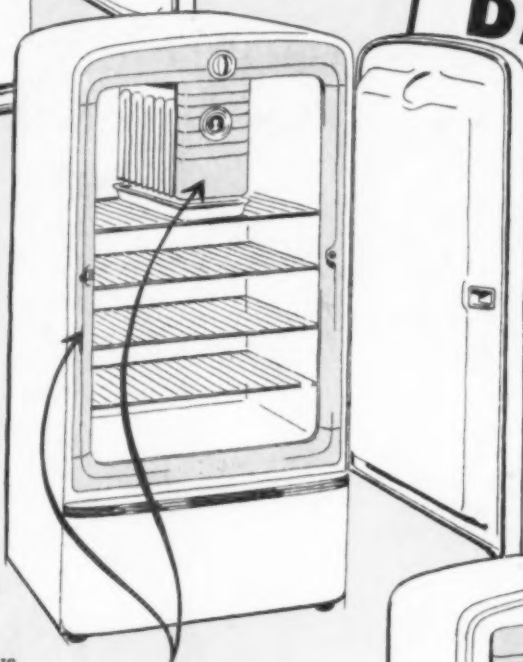
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